(1) Japanese Patent Application Laid-Open No.2002-026812 "POWER SOURCE CONTROL APPARATUS, RECIVING DEVICE FOR REMOTE CONTOROLLER AND OPTICAL COMMUNICATION APPARATUS "

(2) Attached English document is machine language translation obtained from JPO.

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-026812
(43)Date of publication of application : 25.01.2002

(51)Int.CI. H04B 10/00
H02J 1/00
H04Q 9/00

(21)Application number : 2000-203874
(22)Date of filing : 05.07.2000

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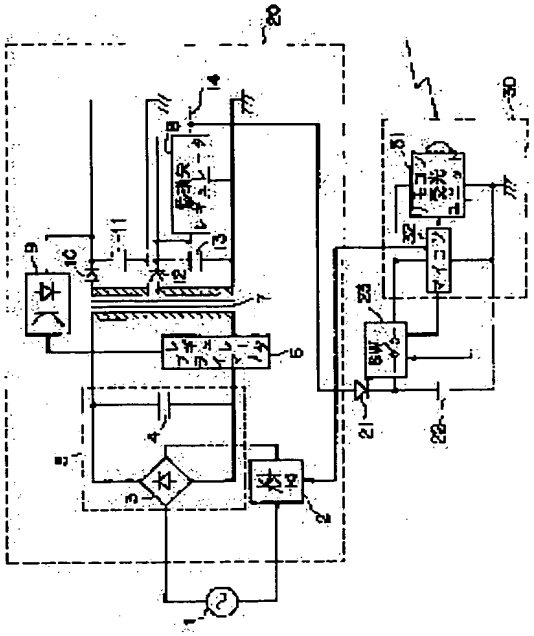
(54) POWER SOURCE CONTROL APPARATUS, RECEIVING DEVICE FOR REMOTE CONTROLLER AND OPTICAL COMMUNICATION APPARATUS

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a power source control apparatus, a receiving device for a remote controller and an optical communication apparatus whose power consumption in stand-by are decreased to nearly null and in which battery consumption in stand-by in battery driving is improved.
SOLUTION: In the case of stand-by when a solid state relay 2 is in an off state, a switch circuit 23 connected between the remote control photodetective circuit 30 of equipment and a large capacity capacitor 22 is turned off to cut off power supply to the circuit 30. Then, when the LED of the circuit 30 being a photodetective element for receiving an optical signal for remote control from a transmission side detects the optical signal when the circuit 23 is in an off state, a control signal is outputted to turn on the circuit 23 to supply power to the circuit 30 from the capacitor 22.



LEGAL STATUS

[Date of request for examination] 12.07.2002
[Date of sending the examiner's decision of rejection] 02.11.2004
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]
[Date of final disposal for application]
[Patent number]
[Date of registration]
[Number of appeal against examiner's decision of rejection]
[Date of requesting appeal against examiner's

decision of rejection]
[Date of extinction of right]

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] Power control characterized by having the switching circuit which will be the power control carried in a device, will be connected between the power-ed supply circuit of the above-mentioned device, and a power source, and will be in an OFF state at the time of standby of the above-mentioned device, and LED which will output the electrical signal which makes the above-mentioned switching circuit an ON state if a lightwave signal is detected in the state of non-bias.

[Claim 2] Power control which will be characterized by having a maintenance means to hold the above-mentioned switching circuit to an ON state in power control according to claim 1 if the above-mentioned switching circuit is turned on with the above-mentioned electrical signal from Above LED.
[Claim 3] When it is carried in a device, and it is connected between the power-ed supply circuit of the above-mentioned device, and a power source in the receiving set for remote control with which LED was used as a photo detector which receives the lightwave signal for remote control from a transmitting side, it has the switching circuit which will be in an OFF state at the time of standby of the above-mentioned device and the above LED detects a lightwave signal in the state of non-bias, it is the receiving set for remote control characterized by to output the electrical signal which makes the above-mentioned switching circuit an ON state.
[Claim 4] The receiving set for remote control which will be characterized by having a maintenance means to hold the above-mentioned switching circuit to an ON state in the receiving set for remote control according to claim 3 if the above-mentioned switching circuit is turned on with the above-mentioned electrical signal from Above LED.
[Claim 5] Optical-communication equipment characterized by having the switching circuit which will be connected between a power-ed supply circuit and a power source, and will be in an OFF state in the optical-communication equipment with which LED was used as a photo detector which receives the lightwave signal from a transmitting side at the time of standby, and LED which will output the electrical signal which makes the above-mentioned switching circuit an ON state if a lightwave signal is detected in the state of non-bias.
[Claim 6] Optical-communication equipment which will be characterized by having a maintenance means to hold the above-mentioned switching circuit to an ON state in optical-communication equipment according to claim 5 if the above-mentioned switching circuit is turned on with the above-mentioned electrical signal from Above LED.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the optical-communication equipment which performs the receiving set for remote control and optical communication which receive the power control which controls the power source of a household-electric-appliances device etc., and the lightwave signal for remote control from remote control (remote control equipment).
[0002]
[Description of the Prior Art] Conventionally, as a receiving set for remote control, it is carried in a common household-electric-appliances device, and there are some which control ON (operating state)/OFF of the power circuit (standby condition).
[0003] Drawing 6 shows the outline block diagram of the important section of the household-electric-appliances device which used the above-mentioned receiving set for remote control. The rectification smoothing circuit 5 (a rectifier circuit 3, capacitor 4 for smooth) connected to the source power supply 1 of AC(alternating current)100V through the solid state relay (SSR) 2, The primary regulator 6 was formed in the primary a power transformer 7 side, and the 1st rectification smoothing circuit which consists of diode 10 and a capacitor 11, and the 2nd rectification smoothing circuit which consists of diode 12 and a capacitor 13 are established in the secondary of a power transformer 7. The output of the above-mentioned 1st rectification smoothing circuit was connected to the input side of a photo coupler 9, and the output side of a photo coupler 9 is connected to the primary regulator 6. Moreover, the low loss regulator 8 is used for the output side of the above-mentioned 2nd rectification smoothing circuit, and power is supplied with the stable supply voltage. The main power supply circuit 20 consists of the above-mentioned solid state relay 2, the smooth rectifier circuit 5, the primary regulator 6, a power transformer 7, the low loss regulator 8, a photo coupler 9, diode 10, a capacitor 11, diode 12, and a capacitor 13. Moreover, the auxiliary power circuit 112 is constituted from an above-mentioned power transformer 109 for standby, a rectification smoothing circuit 110, and a low loss regulator 111, and the remote control light-receiving circuit 115 consists of a remote control light-receiving unit 113 and a microcomputer (henceforth a microcomputer) 114.
[0004] By the household-electric-appliances device using the above-mentioned receiving set for remote control, as shown in drawing 6 , power is supplied to the remote control light-receiving circuit 115 by the auxiliary power circuit 112 at the time of standby. Since the solid state relay 2 is an OFF state at this time, the electric power supply to the main power supply circuit 20 is intercepted.
[0005] And if a user is going to make it turn on the power source of a device by remote control actuation, the remote control light-receiving unit 113 receives the lightwave signal transmitted from the remote control transmitter, and with the electrical signal detected by the remote control light-receiving unit 113, a microcomputer 114 will output a control signal to a solid state relay 2, and will make a solid state relay 2 an ON state. Then, power is supplied to each whole circuit from the main power supply circuit 20 where the source power supply 1 was connected, and a household-electric-appliances device goes into operating state.
[0006] On the contrary, when a user stops actuation of a household-electric-appliances device

by remote control actuation from operating state, the remote control light-receiving unit 113 receives the lightwave signal similarly transmitted from the remote control transmitter, with the electrical signal showing an instruction of a halt of operation detected by the remote control light-receiving unit 113, a microcomputer 114 will output a control signal to a solid state relay 2, and a solid state relay 2 will be in an OFF state. If it does so, the power supply line between the main power supply circuit 20 and a source power supply 1 will be intercepted, and a household-electric-appliances device will be in a idle state of operation, i.e., a standby condition. Since power is supplied to a microcomputer 114 and the remote control light-receiving circuit 115 by the above-mentioned auxiliary power circuit 112 and actuation is continued in the state of this standby, consuming power is continued though small.

[0007] Moreover, as other receiving sets for remote control, it is carried in a common household-electric-appliances device, ON (operating state)/OFF of the power circuit (standby condition) are controlled, and there are some which use the mass capacitor charged at the time of actuation as auxiliary power at the time of standby.

[0008] Drawing 7 shows the outline block diagram of the important section of the household-electric-appliances device which used the above-mentioned receiving set for remote control, and this receiving set for remote control is using the mass capacitor (a mass electrolytic capacitor or a mass super capacitor) 122 as the auxiliary power of the remote control light-receiving circuit 215 instead of the auxiliary power circuit 112 shown in drawing 6 . The above-mentioned mass capacitor 122 is connected to the output of the low loss regulator 8 through diode 121.

[0009] The remote control light-receiving circuit 215 which consists of a microcomputer 214 shown in drawing 7 and a remote control light-receiving unit 213 always needs to be operating state, in order to receive the lightwave signal sent from a remote control transmitter as well as the case of drawing 6 R> 6 at the time of standby. Moreover, as for the remote control light-receiving circuit 215, power is supplied from DC power supply Rhine 14 of the main power supply circuit 20 at the time of actuation, and the mass capacitor 122 is charged by coincidence through DC power supply Rhine 14 and diode 121.

[0010] In the above-mentioned receiving set for remote control, when stopping actuation of a household-electric-appliances device by remote control actuation of a user, the remote control light-receiving unit 213 receives the instruction by the lightwave signal from a remote control transmitter as well as drawing 6 , the contents are judged with a microcomputer 214, and a microcomputer 214 outputs a control signal to a solid state relay 2, and makes a solid state relay 2 an OFF state. And since the electrical potential difference of DC power supply Rhine 14 serves as zero after the above-mentioned solid state relay 2 will be in an OFF state, the mass capacitor 122 starts discharge and the mass capacitor 122 is used as a power source of the remote control light-receiving circuit 215.

[0011] Moreover, since the charge of the mass capacitor 122 stops being sufficient when a standby time becomes long, when it acts as the monitor of the electrical potential difference supplied from the mass capacitor 122 and becomes below a certain voltage level with a microcomputer 214, a microcomputer 214 outputs a control signal to a solid state relay 2, and actuation which charges the mass capacitor 122 again is performed by making a solid state relay 2 turn on. And after completing charge of the mass capacitor 122, a microcomputer 214 outputs a control signal to a solid state relay 2 so that a solid state relay 2 may become again off. Therefore, in order to repeat ON/OFF of the main power supply circuit 20 periodically, power is consumed to whenever [the].

[0012] Moreover, as optical-communication equipment, there is a thing of the pocket mold in which a bidirectional communication link is possible. As shown in drawing 8 , the above-mentioned optical-communication equipment carries the dc-battery 151, and this is being used for it as a power source. With the optical-communication equipment which performs this two-way communication, transmission and reception are made to serve a double purpose by one LED.

[0013] ROM (read-only memory)155 by which the program required for actuation of CPU153 was written in CPU (central processing unit)153 carried in the above-mentioned optical-

communication equipment 150 through the signal bus 154, RAM (random access memory)156 used for are recording of a transmitted and received data etc., and UART (Universal Asynchronous Receiver Ttansmitter)157 which performs parallel/serial conversion of data etc. are connected. The modulation machine 158 for modulating the serial data outputted from the UART157 to the output of the above UART 157, the drive circuit 159 which drives LED160, and LED160 which sends out a lightwave signal Lr1 are connected in order. The above LED 160 changes into an electrical signal the lightwave signal Lr2 received as a photo detector. The amplifier 161 for amplifying that output to the output of this LED160 and the recovery machine 162 which restores to the output signal of that amplifier 161, and is changed into a serial data signal were connected in order, and the output of the recovery machine 162 is connected to the input terminal of UART157. Functional block of the above CPU153, ROM155, RAM156, and UART157, the modulation machine 158, and the recovery machine 162 consists of LSI171 of one chip.

[0014] In the optical-communication equipment 150 of the above-mentioned configuration, while the lightwave signal Lr1 transmitted from LED160 is received with another optical-communication equipment 170 which has the same function as optical-communication equipment 150, the lightwave signal Lr2 conversely transmitted from optical-communication equipment 170 is received by LED160 of optical-communication equipment 150. By doing so, two-way communication by the lightwave signal is performed between optical-communication equipment 150 and optical-communication equipment 170. In addition, the above LED 160 changes and uses transmitting (luminescence) mode and receiving (light-receiving) mode with the Tx/Rx circuit changing switch 163, and is controlling change actuation of the Tx/Rx circuit changing switch 163 by CPU153.

[0015]

[Problem(s) to be Solved by the Invention] However, in the receiving set for remote control shown in drawing 6 and drawing 7 , in order to receive and execute the instruction from the following remote control transmitter etc. at the time of standby of a device, it is necessary to make a microcomputer 114,214 and the remote control light-receiving unit 113,213 into operating state, and there is a problem of continuing consuming power at the time of standby.

[0016] Moreover, with optical-communication equipment 150,170 using the dc-battery 151 shown in drawing 8 as a power source, since it cannot predict when is the lightwave signal from a communications partner received and actuation must be resumed after a communication link finishing and being in a standby condition, it is necessary to always prepare receiving organization. Therefore, with the above-mentioned optical-communication equipment 150,170, at the time of standby, since [of CPU153] it is necessary to use a function and the function of the remote control light-receiving unit 172 in part, there is a problem of continuing exhausting a dc-battery 151.

[0017] Especially, by the household-electric-appliances device, the waiting time amount is longer and reduction of the power consumption at the time of standby has been the common technical problem of all household-electric-appliances devices from the time amount actually used.

[0018] Then, it is to offer the power control, the receiving set for remote control, and optical-communication equipment which can improve sharply the dc-battery consumption at the time of standby in a dc-battery drive while power consumption at the time of standby is made as for the purpose of this invention to zero infinite.

[0019]

[Means for Solving the Problem] It is characterized by to have the switching circuit which the power control of this invention will be power control carried in a device, will be connected between the power-ed supply circuit of the above-mentioned device, and a power source, and will be in an OFF state at the time of standby of the above-mentioned device in order to attain the above-mentioned purpose, and LED (Light Emitting Diode) which will output the electrical signal which makes the above-mentioned switching circuit an ON state if a lightwave signal is detected in the state of non-bias.

[0020] According to the power control of the above-mentioned configuration, the above-mentioned switching circuit connected between the power-ed supply circuits and power sources

which receive an electric power supply from the above-mentioned power source is made into an OFF state at the time of standby of the above-mentioned device. Waiting, if LED of the above-mentioned non-bias condition receives a lightwave signal (light of the wavelength on which LED has sensibility) from the exterior, LED will produce electromotive force and will output this electrical signal that makes the above-mentioned switching circuit an ON state. Then, if the above-mentioned switching circuit is turned on, power will be supplied to the above-mentioned power-ed supply circuit from the above-mentioned power source, and a device will be in operating state. Therefore, since between a power-ed supply circuit and power sources is intercepted in a switching circuit at the time of standby of a device, power consumption at the time of standby is made to zero infinite. Especially, by the pocket mold device of a dc-battery, since a power source intercepts between a power-ed supply circuit and dc-batteries in a switching circuit, it can improve sharply the dc-battery consumption at the time of standby.

[0021] Moreover, power control of 1 operation gestalt is characterized by having a maintenance means to hold the above-mentioned switching circuit to an ON state, if the above-mentioned switching circuit is turned on with the above-mentioned electrical signal from Above LED.

[0022] Even if LED stops receiving a lightwave signal since according to the power control of the above-mentioned operation gestalt a switching circuit is held to an ON state with the above-mentioned maintenance means after the above-mentioned switching circuit will be in an ON state with the electrical signal from Above LED once being in an ON state with the electrical signal from LED, the ON state of a switching circuit can be maintained.

[0023] Moreover, the receiving set for remote control of this invention is carried in a device, and is set to the receiving set for remote control with which LED was used as a photo detector which receives the lightwave signal for remote control from a transmitting side. If it connects between the power-ed supply circuit of the above-mentioned device, and a power source, it has the switching circuit which will be in an OFF state at the time of standby of the above-mentioned device and Above LED detects a lightwave signal in the state of non-bias, it is characterized by outputting the electrical signal which makes the above-mentioned switching circuit an ON state.

[0024] According to the receiving set for remote control of the above-mentioned configuration, the switching circuit connected between the power-ed supply circuit of the above-mentioned device and the power source is made into an OFF state at the time of standby of the above-mentioned device. If this above LED that is a photo detector waiting receives a lightwave signal (light of the wavelength on which LED has sensibility) from transmitting sides (remote control transmitter etc.) in the state of non-bias, LED will produce electromotive force and will output the electrical signal which makes the above-mentioned switching circuit an ON state. Then, if the above-mentioned switching circuit is turned on, power will be supplied to the above-mentioned power-ed supply circuit from the above-mentioned power source, and a device will be in operating state. Therefore, since between a power-ed supply circuit and power sources is intercepted in a switching circuit at the time of standby, power consumption at the time of standby is made to zero infinite. Moreover, since LED which is the photo detector which receives the lightwave signal for remote control from a transmitting side is used for the drive of a switching circuit, circuitry can be simplified and cost can be reduced. Especially, a power source can improve sharply the dc-battery consumption at the time of standby by the pocket mold device of a dc-battery by intercepting between a power-ed supply circuit and dc-batteries in a switching circuit.

[0025] Moreover, the receiving set for remote control of 1 operation gestalt is characterized by having a maintenance means to hold the above-mentioned switching circuit to an ON state, if the above-mentioned switching circuit is turned on with the above-mentioned electrical signal from Above LED.

[0026] Even if LED stops receiving a lightwave signal since according to the receiving set for remote control of the above-mentioned operation gestalt a switching circuit is held to an ON state with the above-mentioned maintenance means after the above-mentioned switching circuit will be in an ON state with the electrical signal from Above LED once being in an ON state with the electrical signal from LED, the ON state of a switching circuit can be maintained.

[0027] Moreover, in the optical-communication equipment with which LED was used as a photo detector which receives the lightwave signal from a transmitting side, it connects between a power-ed supply circuit and a power source, and the optical-communication equipment of this invention is characterized by having the switching circuit which will be in an OFF state at the time of standby, and LED which will output the electrical signal which makes the above-mentioned switching circuit an ON state if a lightwave signal is detected in the state of non-bias.

[0028] According to the optical-communication equipment of the above-mentioned configuration, the switching circuit connected between the above-mentioned power-ed supply circuit and the power source is made into an OFF state at the time of standby. If this above LED that is a photo detector for a communication link waiting receives a lightwave signal (light of the wavelength on which LED has sensibility) from a transmitting side in the state of non-bias, LED will produce electromotive force and will output the electrical signal which makes the above-mentioned switching circuit an ON state. Then, if the above-mentioned switching circuit is turned on, power will be supplied to the above-mentioned power-ed supply circuit from the above-mentioned power source, and this optical-communication equipment will be in operating state. Therefore, since between a power-ed supply circuit and power sources is intercepted in a switching circuit at the time of standby, power consumption at the time of standby is made to zero infinite. Moreover, since LED which is the photo detector for a communication link which receives the lightwave signal from a transmitting side is used for the drive of a switching circuit, circuitry can be simplified and cost can be reduced. Especially, a power source can improve sharply the dc-battery consumption at the time of standby by the pocket mold device of a dc-battery by intercepting between a power-ed supply circuit and dc-batteries in a switching circuit. In addition, this optical-communication equipment may perform bidirectional optical communication, optical communication of only an one direction may be performed, and, in the case of one direction optical communication, this invention is applied to a receiving side.
[0029] Moreover, the optical-communication equipment of 1 operation gestalt is characterized by having a maintenance means to hold the above-mentioned switching circuit to an ON state, if the above-mentioned switching circuit is turned on with the above-mentioned electrical signal from Above LED.
[0030] Even if LED stops receiving a lightwave signal since according to the optical-communication equipment of the above-mentioned operation gestalt a switching circuit is held to an ON state with the above-mentioned maintenance means after the above-mentioned switching circuit will be in an ON state with the electrical signal from Above LED once being in an ON state with the electrical signal from LED, the ON state of a switching circuit can be maintained.
[0031]
[Embodiment of the Invention] Hereafter, the gestalt of implementation of illustration explains the power control, the receiving set for remote control, and optical-communication equipment of this invention to a detail.
[0032] (The 1st operation gestalt) Drawing 1 is the outline block diagram of the important section of the household-electric-appliances device which used the receiving set for remote control of the 1st operation gestalt of this invention.
[0033] The household-electric-appliances device using this receiving set for remote control The solid state relay 2 by which the end of a source power supply 1 was connected to the end as shown in drawing 1 (SSR), The rectifier circuit 3 where one input terminal was connected to the other end of the above-mentioned solid state relay 2, and the input terminal of another side was connected to the other end of a source power supply 1 (diode bridge), The capacitor 4 for smooth by which both ends were connected to both the output terminals of the positive/negative of the above-mentioned rectifier circuit 3, It has the primary regulator 6 by which the end was connected to the negative-electrode side output terminal of the above-mentioned rectifier circuit 3, and the power transformer 7 by which the end of a primary side coil was connected to the positive-electrode side output terminal of the above-mentioned rectifier circuit 3, and the other end of a primary side coil was connected to the other end of the above-mentioned primary regulator 6. The rectification smoothing circuit 5 consists of an above-

mentioned rectifier circuit 3 and a capacitor 4 for smooth. Moreover, in in Japan, a source power supply 1 is AC100V.

[0034] Moreover, the household-electric-appliances device using the above-mentioned receiving set for remote control The diode 10 by which the anode was connected to the end of the 1st coil of the secondary of a power transformer 7, The capacitor 11 by which the end was connected to the cathode of the above-mentioned diode 10, and the other end was connected to the other end of the 1st coil of the above, The diode 12 by which the anode was connected to the end of the 2nd coil of the secondary of a power transformer 7, The capacitor 13 by which the end was connected to the cathode of the above-mentioned diode 12, and the other end was connected to the other end of the 2nd coil of the above, The low loss regulator 8 by which the input terminal was connected to the cathode of the above-mentioned diode 12, and the grand terminal was connected to the other end of the 2nd coil of the above, The input terminal was connected to the cathode of the above-mentioned diode 10, and the output terminal is equipped with the photo coupler 9 connected to the control input terminal of the primary regulator 6. The 1st rectification smoothing circuit is constituted from above-mentioned diode 10 and a capacitor 11, and the 2nd rectification smoothing circuit consists of diode 12 and a capacitor 13. Moreover, the end of DC power supply Rhine 14 is connected to the output terminal of the above-mentioned low loss regulator 8.

[0035] According to the DC power supply electrical potential difference which needs the secondary of the above-mentioned power transformer 7 in each circuit by the side of a load (not shown), only the required number of power-source Rhine (drawing 1 two) is outputted. Moreover, in order to obtain supply voltage stable irrespective of a load effect, the above-mentioned low loss regulator 8 is used for the secondary output of a power transformer 7.

[0036] The main power supply circuit 20 consists of the above-mentioned solid state relay 2, the smooth rectifier circuit 5, the primary regulator 6, a power transformer 7, the low loss regulator 8, a photo coupler 9, diode 10, a capacitor 11, diode 12, and a capacitor 13.

[0037] Furthermore, the anode of diode 21 was connected to the other end of above-mentioned DC power supply Rhine 14, and the mass capacitor 22 is connected between the cathode of diode 21, and a gland. The end of a switching circuit 23 was connected to the cathode of the above-mentioned diode 21, the other end of a switching circuit 23 was connected to the power-source input terminal of the microcomputer 32 as a maintenance means, and the remote control light-receiving unit 31, respectively, and each grand terminal of the remote control light-receiving unit 31 is connected with the microcomputer 32 in the gland, respectively. In this way, as for a microcomputer 32 and the remote control light-receiving unit 31, power is supplied from DC power supply Rhine 14 of the secondary of a power transformer 7 through diode 21 and a switching circuit 23. The remote control light-receiving circuit 30 as a power-ed supply circuit is constituted from an above-mentioned microcomputer 32 and a remote control light-receiving unit 31, and the receiving set for remote control consists of a switching circuit 23, a microcomputer 32, and a remote control light-receiving unit 31.

[0038] At the time of actuation of a device, the switching circuit 23 is maintaining the ON state with the control signal from a microcomputer 32, and while power is supplied through diode 21 from DC power supply Rhine 14, as for the remote control light-receiving circuit 30, the mass capacitor 22 is charged.

[0039] And when stopping actuation of a device by remote control actuation of a user, the remote control light-receiving unit 31 receives the instruction by the lightwave signal from a remote control transmitter (not shown), the contents of the received instruction are judged with a microcomputer 32, and a microcomputer 32 outputs a control signal to a solid state relay 2, and makes a solid state relay 2 off. To coincidence, a microcomputer 32 ends the actuation itself. Thereby, the control signal over a switching circuit 23 stops, and a switching circuit 23 becomes off. As for a device, the electric power supplies to all the circuits of a device also including the remote control light-receiving circuit 30 are intercepted by this, and a device goes into a standby condition by it. Since the electric power supply to each circuit is intercepted in the state of this standby, power consumption becomes it is infinite and close to zero.

[0040] Moreover, drawing 2 shows the internal-circuitry block of the remote control light-

receiving unit 31 shown in drawing 1 . As shown in drawing 2 , LED41 as a photo detector which has sensibility is built in the wavelength of the lightwave signal transmitted from the remote control transmitter (not shown), and this remote control light-receiving unit 31 receives the lightwave signal sent by this from the remote control transmitter, and changes it into an electrical signal. And after being amplified with the amplifier 42 connected immediately after LED41, it is band-limited by the band pass filter (BPF) 43 of the latter part of the amplifier 42, and gets over with the recovery machine 44 further, and after the changed electrical signal is shaped in waveform by the waveform shaper 45, it is sent to a microcomputer 32 (shown in drawing 1).

[0041] Moreover, the above LED 41 outputs the electrical signal which changed the lightwave signal which received light by LED41 as a control signal required for actuation of a switching circuit 23 (shown in drawing 1), when returning actuation of the device of a standby condition. Also under non-bias, the above LED 41 will generate electromotive force, if the light of the wavelength in that sensibility is received, and it uses this electromotive force as a control signal which makes a switching circuit 23 turn on.

[0042] Hereafter, the household-electric-appliances device using the receiving set for remote control of the above-mentioned configuration explains the actuation when resuming actuation from a standby condition.

[0043] If the start button (power-source ON / off-carbon button) of a remote control transmitter (not shown) of operation is pushed in order that a user may operate a household-electric-appliances device with a remote control transmitter, a lightwave signal will be transmitted from a remote control transmitter towards the remote control light-receiving unit 31 shown in drawing 1 of the body of a household-electric-appliances device.

[0044] And the lightwave signal transmitted from the remote control transmitter which is not illustrated is received by LED41 (shown in drawing 2) built in the remote control light-receiving unit 31. In LED41, by the received lightwave signal, an electrical signal occurs and this electrical signal is transmitted to a switching circuit 23 as a control signal.

[0045] A switching circuit 23 turns on by this, and the mass capacitor 22 starts discharge, that is, power is supplied to the remote control light-receiving circuit 30. A microcomputer 32 starts actuation, a control signal is outputted to a solid state relay 2 as the first instruction, and a solid state relay 2 is made to turn on by this. When the above-mentioned solid state relay 2 turns on, a power source is supplied to the whole device from the main power supply circuit 20, and the whole device returns to operating state.

[0046] As the above-mentioned switching circuit 23 is shown in drawing 5 , it consists of NPN transistors Q1, a collector side is connected to a power-source side (mass capacitor 22), and the emitter side is connected to the load side (power supply terminal of the remote control light-receiving circuit 30). The end of resistance R1 was connected to the base of NPN transistor Q1, the anode of diode LED 1 (equivalent to LED41) was connected to the other end of resistance R1, and the cathode of diode LED 1 is connected to a gland. Power control consists of above-mentioned diode LED 1, resistance R1, and NPN transistor Q1.

[0047] Moreover, in drawing 2 , although not illustrated, the signal from a microcomputer 32 is inputted into the base of the transistor Q1 of a switching circuit 23, the transistor Q1 of a switching circuit 23 turns on with diode LED 1, and after power is supplied to the remote control light-receiving circuit 30 containing the microcomputer 32 shown in drawing 1 from the main power supply circuit 20, control is performed so that an ON state may be continued from the microcomputer 32 as a maintenance means to a switching circuit 23.

[0048] Thus, since between the remote control light-receiving circuit 30 and the mass capacitors 22 is intercepted in the above-mentioned switching circuit 23, power consumption at the time of standby of a device can be made into zero infinite. Moreover, since LED of the remote control light-receiving unit 31 which receives the lightwave signal for remote control from a transmitting side and which is a photo detector is used for the drive of a switching circuit 23, circuitry can be simplified and cost can be reduced.

[0049] Moreover, even if the remote control light-receiving unit 31 stops receiving a lightwave signal since a switching circuit 23 is held to an ON state with the microcomputer 32 as the

above-mentioned maintenance means once being in an ON state with the electrical signal from the remote control light-receiving unit 31, the ON state of a switching circuit 23 can be maintained.

[0050] Although the household-electric-appliances device using the receiving set for remote control of the above-mentioned 1st operation gestalt was explained, with the application of the receiving set for remote control of this invention, a potato is good for all the electronic equipment that will be not only in a household-electric-appliances device but other standby conditions.

[0051] (The 2nd operation gestalt) Drawing 3 is the outline block diagram of the optical-communication equipment of the 2nd operation gestalt of this invention. As shown in drawing 3 , common LED is being used for this optical-communication equipment as a transceiver component of a lightwave signal. That is, LED is used as an application of both a light emitting device and a photo detector.

[0052] Hereafter, actuation in case the above-mentioned optical-communication equipment resumes actuation from a standby condition is explained.

[0053] While the lightwave signal Lr1 transmitted from LED60 of the above-mentioned optical-communication equipment 50 is received with another optical-communication equipment 70 which has the same function as optical-communication equipment 80, the lightwave signal Lr2 conversely transmitted from optical-communication equipment 70 is received by LED60 of optical-communication equipment 50. By doing so, two-way communication by the lightwave signal is performed between optical-communication equipment 50 and optical-communication equipment 70.

[0054] LED60 of the above-mentioned optical-communication equipment 50 changes the electrical signal from the drive circuit 59 into a lightwave signal at the time of lightwave signal transmission (luminescence), and changes the lightwave signal Lr2 from optical-communication equipment 70 into an electrical signal at the time of lightwave signal reception. At this time, the Tx/Rx circuit changing switch 63 was operated with the high level or low level of a control signal outputted from CPU53, and LED60 is changed to luminescence mode and light-receiving mode. That is, LED60 makes LED60 luminescence mode, when transmitting a lightwave signal, and when receiving a lightwave signal, it does not transmit [LED] by making LED60 into light-receiving mode and receive to coincidence. This is performing two-way communication of a half duplex by one LED60 (depending on the case, two or more LED may be used [the case where he wants to obtain a large angle of beam spread, and] as a lot to obtain stronger optical reinforcement).

[0055] When data are transmitted, after the data stored in RAM56 are transmitted to UART57 and changed into serial data from parallel data by UART57 by control of CPU53 based on the program of ROM55, it is transmitted to the modulation machine 58. And the signal modulated with the modulation machine 58 is sent out as a lightwave signal Lr1 from LED60 through the drive circuit 59. At this time, LED60 serves as luminescence mode with the Tx/Rx circuit changing switch 63 controlled by the control signal from CPU53.

[0056] On the other hand, when receiving data, in response to the lightwave signal Lr2 transmitted from optical-communication equipment 70, it changes into an electrical signal by LED60 of optical-communication equipment 80. And the signal changed into the electrical signal is further transmitted to UART57, after being transmitted to the recovery machine 62 after being amplified with an amplifier 61, and getting over to serial data with the recovery machine 62. Then, data store data in RAM56 by control of CPU53 based on the program of ROM55, after being changed into parallel data by UART57. At this time, LED60 serves as the receive mode with the Tx/Rx circuit changing switch 63 controlled by the control signal from CPU53.

[0057] Functional block of the above CPU53, ROM55, RAM56, and UART57, the modulation machine 58, and the recovery machine 62 consists of LSI71 as a power-ed supply circuit of one chip. Moreover, the optical transceiver unit 72 which served as the power-ed supply circuit consists of an above-mentioned drive circuit 59, LED60, and amplifier 61.

[0058] If a certain fixed time amount communication link breaks off between the above-mentioned optical-communication equipment 50 and optical-communication equipment 70, optical-communication equipment 50 and optical-communication equipment 70 will go into a

standby condition by control of CPU53. After CPU53 ends that actuation at this time, the control signal over a switching circuit 52 stops in coincidence, and a switching circuit 52 becomes off. Consequently, the dc-battery 51 of optical-communication equipment 50 is separated from each circuit, and consumption of a dc-battery becomes it is infinite and close to zero.

[0059] And when the optical-communication equipment 50 in a standby condition re-starts a power source by the appeal from another optical-communication equipment 70, LED60 in a non-bias condition receives the lightwave signal from optical-communication equipment 70, this is changed into an electrical signal, and the changed electrical signal is sent to a switching circuit 52 as a control signal which turns on a switching circuit 52. And if a switching circuit 52 receives the control signal from LED60, a switching circuit 52 will be in an ON state, and power will be supplied to each circuit from a dc-battery 51. Thereby, CPU53 as a maintenance means resumes actuation, and a control signal is outputted to a switching circuit 52 so that the ON state of a switching circuit 52 may be continued as the first actuation.

[0060] Thus, since between a dc-battery 51 and each circuit is intercepted in the above-mentioned switching circuit 52, power consumption at the time of standby can be made into zero infinite. Moreover, since LED60 which is the photo detector for a communication link which receives the lightwave signal from a transmitting side is used for the drive of a switching circuit 52, circuitry can be simplified and cost can be reduced. Moreover, the dc-battery consumption at the time of standby is sharply improvable.

[0061] Moreover, even if LED60 stops receiving a lightwave signal since a switching circuit 52 is held to an ON state by CPU53 as the above-mentioned maintenance means once being in an ON state with the electrical signal from LED60, the ON state of a switching circuit 52 can be maintained.

[0062] (The 3rd operation gestalt) Drawing 4 is the outline block diagram of the optical-communication equipment of the 3rd operation gestalt of this invention. As this optical-communication equipment is shown in drawing 4 , only for power-source starting of the optical-communication equipment in a standby condition, it is what carried LED40 for light-receiving, and the same configuration as the optical-communication equipment of the 2nd operation gestalt is carried out except for LED40 for light-receiving, and the same configuration section attaches the same reference number, and omits explanation. In addition, while constituting functional block of the above CPU53, ROM55, RAM56, and UART57, the modulation machine 58, and the recovery machine 62 from LSI71 as a power-ed supply circuit of one chip, the optical transceiver unit 82 consists of a drive circuit 59, LED81, and amplifier 61.

[0063] In the optical-communication equipment 80 shown in drawing 4 , when the optical-communication equipment in a standby condition re-starts a power source by remote control actuation, LED40 in a non-bias condition receives the lightwave signal from the optical-communication equipment 70 of a transmitting side, this is changed into an electrical signal, and the changed electrical signal is sent to a switching circuit 52 as a control signal which turns on a switching circuit 52. And if a switching circuit 52 receives the control signal from LED40, a switching circuit 52 will be in an ON state, and power will be supplied to each circuit from a dc-battery 51. Thereby, CPU53 as a maintenance means resumes actuation, and a control signal is outputted to a switching circuit 52 so that the ON state of a switching circuit 52 may be continued as actuation of the beginning of CPU53.

[0064] Thus, since between a dc-battery 51 and each circuit is intercepted in the above-mentioned switching circuit 52, power consumption at the time of standby can be made into zero infinite. Moreover, since power control is constituted from LED40 and a switching circuit 52, circuitry can be simplified and cost can be reduced. Moreover, the dc-battery consumption at the time of standby is sharply improvable.

[0065] Moreover, even if LED40 stops receiving a lightwave signal since a switching circuit 52 is held to an ON state by CPU53 as the above-mentioned maintenance means once being in an ON state with the electrical signal from LED40, the ON state of a switching circuit 52 can be maintained.

[0066] Of course in the power control of this invention, you may apply not only to the receiving

set for remote control, or optical-communication equipment but to all other electronic equipment.

[0067] Although the above-mentioned 2nd and 3rd operation gestalt explained the optical-communication equipment which performs bidirectional optical communication, this invention may be applied to the receiving side of optical-communication equipment which performs optical communication of an one direction.

[0068] Moreover, although the microcomputer 32 and CPU53 were used as a maintenance means, a maintenance means may constitute not only this but a switching circuit from the above 1st - a 3rd operation gestalt in other circuits which can be held to an ON state.

[0069]

[Effect of the Invention] As mentioned above, according to the power control, the receiving set for Mocon, and optical-communication equipment of this invention, a switching circuit is established in Daigen of current supply Rhine between a power-ed supply circuit and a power source, and during standby, the electric power supply from a power source to each circuit is intercepted by making that switching circuit into an OFF state, and it becomes possible to bring the power consumption at the time of standby close to zero infinite so that clearly. Thereby, in the case of a pocket device, it becomes possible [developing the life of the dc-battery at the time of standby]. Moreover, since the electromotive force of LED for the object for remote control light-receiving or optical communication is used for starting of a switching circuit while it is realizable with an easy configuration with a transistor as the above-mentioned switching circuit, it is not necessary to make a big circuit change. Furthermore, Above LED is cheap, since it is obtained, even if it newly carries out LED loading to starting of the above-mentioned switching circuit, cannot affect cost so much, but can constitute this power control, the receiving set for Mocon, and optical-communication equipment more easily.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the optical-communication equipment which performs the receiving set for remote control and optical communication which receive the power control which controls the power source of a household-electric-appliances device etc., and the lightwave signal for remote control from remote control (remote control equipment).

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PRIOR ART

[Description of the Prior Art] Conventionally, as a receiving set for remote control, it is carried in a common household-electric-appliances device, and there are some which control ON (operating state)/OFF of the power circuit (standby condition).
[0003] Drawing 6 shows the outline block diagram of the important section of the household-electric-appliances device which used the above-mentioned receiving set for remote control. The rectification smoothing circuit 5 (a rectifier circuit 3, capacitor 4 for smooth) connected to the source power supply 1 of AC(alternating current)100V through the solid state relay (SSR) 2, The primary regulator 6 was formed in the primary a power transformer 7 side, and the 1st rectification smoothing circuit which consists of diode 10 and a capacitor 11, and the 2nd rectification smoothing circuit which consists of diode 12 and a capacitor 13 are established in the secondary of a power transformer 7. The output of the above-mentioned 1st rectification smoothing circuit was connected to the input side of a photo coupler 9, and the output side of a photo coupler 9 is connected to the primary regulator 6. Moreover, the low loss regulator 8 is used for the output side of the above-mentioned 2nd rectification smoothing circuit, and power is supplied with the stable supply voltage. The main power supply circuit 20 consists of the above-mentioned solid state relay 2, the smooth rectifier circuit 5, the primary regulator 6, a power transformer 7, the low loss regulator 8, a photo coupler 9, diode 10, a capacitor 11, diode 12, and a capacitor 13. Moreover, the auxiliary power circuit 112 is constituted from an above-mentioned power transformer 109 for standby, a rectification smoothing circuit 110, and a low loss regulator 111, and the remote control light-receiving circuit 115 consists of a remote control light-receiving unit 113 and a microcomputer (henceforth a microcomputer) 114.
[0004] By the household-electric-appliances device using the above-mentioned receiving set for remote control, as shown in drawing 6 , power is supplied to the remote control light-receiving circuit 115 by the auxiliary power circuit 112 at the time of standby. Since the solid state relay 2 is an OFF state at this time, the electric power supply to the main power supply circuit 20 is intercepted.
[0005] And if a user is going to make it turn on the power source of a device by remote control actuation, the remote control light-receiving unit 113 receives the lightwave signal transmitted from the remote control transmitter, and with the electrical signal detected by the remote control light-receiving unit 113, a microcomputer 114 will output a control signal to a solid state relay 2, and will make a solid state relay 2 an ON state. Then, power is supplied to each whole circuit from the main power supply circuit 20 where the source power supply 1 was connected, and a household-electric-appliances device goes into operating state.
[0006] On the contrary, when a user stops actuation of a household-electric-appliances device by remote control actuation from operating state, the remote control light-receiving unit 113 receives the lightwave signal similarly transmitted from the remote control transmitter, with the electrical signal showing an instruction of a halt of operation detected by the remote control light-receiving unit 113, a microcomputer 114 will output a control signal to a solid state relay 2, and a solid state relay 2 will be in an OFF state. If it does so, the power supply line between the main power supply circuit 20 and a source power supply 1 will be intercepted, and a household-electric-appliances device will be in a idle state of operation, i.e., a standby condition. Since

power is supplied to a microcomputer 114 and the remote control light-receiving circuit 115 by the above-mentioned auxiliary power circuit 112 and actuation is continued in the state of this standby, consuming power is continued though small.

[0007] Moreover, as other receiving sets for remote control, it is carried in a common household-electric-appliances device, ON (operating state)/OFF of the power circuit (standby condition) are controlled, and there are some which use the mass capacitor charged at the time of actuation as auxiliary power at the time of standby.

[0008] Drawing 7 shows the outline block diagram of the important section of the household-electric-appliances device which used the above-mentioned receiving set for remote control, and this receiving set for remote control is using the mass capacitor (a mass electrolytic capacitor or a mass super capacitor) 122 as the auxiliary power of the remote control light-receiving circuit 215 instead of the auxiliary power circuit 112 shown in drawing 6 . The above-mentioned mass capacitor 122 is connected to the output of the low loss regulator 8 through diode 121.

[0009] The remote control light-receiving circuit 215 which consists of a microcomputer 214 shown in drawing 7 and a remote control light-receiving unit 213 always needs to be operating state, in order to receive the lightwave signal sent from a remote control transmitter as well as the case of drawing 6 R> 6 at the time of standby. Moreover, as for the remote control light-receiving circuit 215, power is supplied from DC power supply Rhine 14 of the main power supply circuit 20 at the time of actuation, and the mass capacitor 122 is charged by coincidence through DC power supply Rhine 14 and diode 121.

[0010] In the above-mentioned receiving set for remote control, when stopping actuation of a household-electric-appliances device by remote control actuation of a user, the remote control light-receiving unit 213 receives the instruction by the lightwave signal from a remote control transmitter as well as drawing 6 , the contents are judged with a microcomputer 214, and a microcomputer 214 outputs a control signal to a solid state relay 2, and makes a solid state relay 2 an OFF state. And since the electrical potential difference of DC power supply Rhine 14 serves as zero after the above-mentioned solid state relay 2 will be in an OFF state, the mass capacitor 122 starts discharge and the mass capacitor 122 is used as a power source of the remote control light-receiving circuit 215.

[0011] Moreover, since the charge of the mass capacitor 122 stops being sufficient when a standby time becomes long, when it acts as the monitor of the electrical potential difference supplied from the mass capacitor 122 and becomes below a certain voltage level with a microcomputer 214, a microcomputer 214 outputs a control signal to a solid state relay 2, and actuation which charges the mass capacitor 122 again is performed by making a solid state relay 2 turn on. And after completing charge of the mass capacitor 122, a microcomputer 214 outputs a control signal to a solid state relay 2 so that a solid state relay 2 may become again off. Therefore, in order to repeat ON/OFF of the main power supply circuit 20 periodically, power is consumed to whenever [the].

[0012] Moreover, as optical-communication equipment, there is a thing of the pocket mold in which a bidirectional communication link is possible. As shown in drawing 8 , the above-mentioned optical-communication equipment carries the dc-battery 151, and this is being used for it as a power source. With the optical-communication equipment which performs this two-way communication, transmission and reception are made to serve a double purpose by one LED.

[0013] ROM (read-only memory)155 by which the program required for actuation of CPU153 was written in CPU (central processing unit)153 carried in the above-mentioned optical-communication equipment 150 through the signal bus 154, RAM (random access memory)156 used for are recording of a transmitted and received data etc., and UART (Universal Asynchronous Receiver Ttansmitter)157 which performs parallel/serial conversion of data etc. are connected. The modulation machine 158 for modulating the serial data outputted from the UART157 to the output of the above UART 157, the drive circuit 159 which drives LED160, and LED160 which sends out a lightwave signal Lr1 are connected in order. The above LED 160 changes into an electrical signal the lightwave signal Lr2 received as a photo detector. The

amplifier 161 for amplifying that output to the output of this LED160 and the recovery machine 162 which restores to the output signal of that amplifier 161, and is changed into a serial data signal were connected in order, and the output of the recovery machine 162 is connected to the input terminal of UART157. Functional block of the above CPU153, ROM155, RAM156, and UART157, the modulation machine 158, and the recovery machine 162 consists of LSI171 of one chip.

[0014] In the optical-communication equipment 150 of the above-mentioned configuration, while the lightwave signal Lr1 transmitted from LED160 is received with another optical-communication equipment 170 which has the same function as optical-communication equipment 150, the lightwave signal Lr2 conversely transmitted from optical-communication equipment 170 is received by LED160 of optical-communication equipment 150. By doing so, two-way communication by the lightwave signal is performed between optical-communication equipment 150 and optical-communication equipment 170. In addition, the above LED 160 changes and uses transmitting (luminescence) mode and receiving (light-receiving) mode with the Tx/Rx circuit changing switch 163, and is controlling change actuation of the Tx/Rx circuit changing switch 163 by CPU153.

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EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, according to the power control, the receiving set for Mocon, and optical-communication equipment of this invention, a switching circuit is established in Daigen of current supply Rhine between a power-ed supply circuit and a power source, and during standby, the electric power supply from a power source to each circuit is intercepted by making that switching circuit into an OFF state, and it becomes possible to bring the power consumption at the time of standby close to zero infinite so that clearly. Thereby, in the case of a pocket device, it becomes possible [developing the life of the dc-battery at the time of standby]. Moreover, since the electromotive force of LED for the object for remote control light-receiving or optical communication is used for starting of a switching circuit while it is realizable with an easy configuration with a transistor as the above-mentioned switching circuit, it is not necessary to make a big circuit change. Furthermore, Above LED is cheap, since it is obtained, even if it newly carries out LED loading to starting of the above-mentioned switching circuit, cannot affect cost so much, but can constitute this power control, the receiving set for Mocon, and optical-communication equipment more easily.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, in the receiving set for remote control shown in drawing 6 and drawing 7 , in order to receive and execute the instruction from the following remote control transmitter etc. at the time of standby of a device, it is necessary to make a microcomputer 114,214 and the remote control light-receiving unit 113,213 into operating state, and there is a problem of continuing consuming power at the time of standby.
[0016] Moreover, with optical-communication equipment 150,170 using the dc-battery 151 shown in drawing 8 as a power source, since it cannot predict when is the lightwave signal from a communications partner received and actuation must be resumed after a communication link finishing and being in a standby condition, it is necessary to always prepare receiving organization. Therefore, with the above-mentioned optical-communication equipment 150,170, at the time of standby, since [of CPU153] it is necessary to use a function and the function of the remote control light-receiving unit 172 in part, there is a problem of continuing exhausting a dc-battery 151.
[0017] Especially, by the household-electric-appliances device, the waiting time amount is longer and reduction of the power consumption at the time of standby has been the common technical problem of all household-electric-appliances devices from the time amount actually used.
[0018] Then, it is to offer the power control, the receiving set for remote control, and optical-communication equipment which can improve sharply the dc-battery consumption at the time of standby in a dc-battery drive while power consumption at the time of standby is made as for the purpose of this invention to zero infinite.

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MEANS

[Means for Solving the Problem] It is characterized by to have the switching circuit which the power control of this invention will be power control carried in a device, will be connected between the power-ed supply circuit of the above-mentioned device, and a power source, and will be in an OFF state at the time of standby of the above-mentioned device in order to attain the above-mentioned purpose, and LED (Light Emitting Diode) which will output the electrical signal which makes the above-mentioned switching circuit an ON state if a lightwave signal is detected in the state of non-bias.
[0020] According to the power control of the above-mentioned configuration, the above-mentioned switching circuit connected between the power-ed supply circuits and power sources which receive an electric power supply from the above-mentioned power source is made into an OFF state at the time of standby of the above-mentioned device. Waiting, if LED of the above-mentioned non-bias condition receives a lightwave signal (light of the wavelength on which LED has sensibility) from the exterior, LED will produce electromotive force and will output this electrical signal that makes the above-mentioned switching circuit an ON state. Then, if the above-mentioned switching circuit is turned on, power will be supplied to the above-mentioned power-ed supply circuit from the above-mentioned power source, and a device will be in operating state. Therefore, since between a power-ed supply circuit and power sources is intercepted in a switching circuit at the time of standby of a device, power consumption at the time of standby is made to zero infinite. Especially, by the pocket mold device of a dc-battery, since a power source intercepts between a power-ed supply circuit and dc-batteries in a switching circuit, it can improve sharply the dc-battery consumption at the time of standby.
[0021] Moreover, power control of 1 operation gestalt is characterized by having a maintenance means to hold the above-mentioned switching circuit to an ON state, if the above-mentioned switching circuit is turned on with the above-mentioned electrical signal from Above LED.
[0022] Even if LED stops receiving a lightwave signal since according to the power control of the above-mentioned operation gestalt a switching circuit is held to an ON state with the above-mentioned maintenance means after the above-mentioned switching circuit will be in an ON state with the electrical signal from Above LED once being in an ON state with the electrical signal from LED, the ON state of a switching circuit can be maintained.
[0023] Moreover, the receiving set for remote control of this invention is carried in a device, and is set to the receiving set for remote control with which LED was used as a photo detector which receives the lightwave signal for remote control from a transmitting side. If it connects between the power-ed supply circuit of the above-mentioned device, and a power source, it has the switching circuit which will be in an OFF state at the time of standby of the above-mentioned device and Above LED detects a lightwave signal in the state of non-bias, it is characterized by outputting the electrical signal which makes the above-mentioned switching circuit an ON state.
[0024] According to the receiving set for remote control of the above-mentioned configuration, the switching circuit connected between the power-ed supply circuit of the above-mentioned device and the power source is made into an OFF state at the time of standby of the above-mentioned device. If this above LED that is a photo detector waiting receives a lightwave signal

(light of the wavelength on which LED has sensibility) from transmitting sides (remote control transmitter etc.) in the state of non-bias, LED will produce electromotive force and will output the electrical signal which makes the above-mentioned switching circuit an ON state. Then, if the above-mentioned switching circuit is turned on, power will be supplied to the above-mentioned power-ed supply circuit from the above-mentioned power source, and a device will be in operating state. Therefore, since between a power-ed supply circuit and power sources is intercepted in a switching circuit at the time of standby, power consumption at the time of standby is made to zero infinite. Moreover, since LED which is the photo detector which receives the lightwave signal for remote control from a transmitting side is used for the drive of a switching circuit, circuitry can be simplified and cost can be reduced. Especially, a power source can improve sharply the dc-battery consumption at the time of standby by the pocket mold device of a dc-battery by intercepting between a power-ed supply circuit and dc-batteries in a switching circuit.

[0025] Moreover, the receiving set for remote control of 1 operation gestalt is characterized by having a maintenance means to hold the above-mentioned switching circuit to an ON state, if the above-mentioned switching circuit is turned on with the above-mentioned electrical signal from Above LED.

[0026] Even if LED stops receiving a lightwave signal since according to the receiving set for remote control of the above-mentioned operation gestalt a switching circuit is held to an ON state with the above-mentioned maintenance means after the above-mentioned switching circuit will be in an ON state with the electrical signal from Above LED once being in an ON state with the electrical signal from LED, the ON state of a switching circuit can be maintained.

[0027] Moreover, in the optical-communication equipment with which LED was used as a photo detector which receives the lightwave signal from a transmitting side, it connects between a power-ed supply circuit and a power source, and the optical-communication equipment of this invention is characterized by having the switching circuit which will be in an OFF state at the time of standby, and LED which will output the electrical signal which makes the above-mentioned switching circuit an ON state if a lightwave signal is detected in the state of non-bias.

[0028] According to the optical-communication equipment of the above-mentioned configuration, the switching circuit connected between the above-mentioned power-ed supply circuit and the power source is made into an OFF state at the time of standby. If this above LED that is a photo detector for a communication link waiting receives a lightwave signal (light of the wavelength on which LED has sensibility) from a transmitting side in the state of non-bias, LED will produce electromotive force and will output the electrical signal which makes the above-mentioned switching circuit an ON state. Then, if the above-mentioned switching circuit is turned on, power will be supplied to the above-mentioned power-ed supply circuit from the above-mentioned power source, and this optical-communication equipment will be in operating state. Therefore, since between a power-ed supply circuit and power sources is intercepted in a switching circuit at the time of standby, power consumption at the time of standby is made to zero infinite. Moreover, since LED which is the photo detector for a communication link which receives the lightwave signal from a transmitting side is used for the drive of a switching circuit, circuitry can be simplified and cost can be reduced. Especially, a power source can improve sharply the dc-battery consumption at the time of standby by the pocket mold device of a dc-battery by intercepting between a power-ed supply circuit and dc-batteries in a switching circuit. In addition, this optical-communication equipment may perform bidirectional optical communication, optical communication of only an one direction may be performed, and, in the case of one direction optical communication, this invention is applied to a receiving side.

[0029] Moreover, the optical-communication equipment of 1 operation gestalt is characterized by having a maintenance means to hold the above-mentioned switching circuit to an ON state, if the above-mentioned switching circuit is turned on with the above-mentioned electrical signal from Above LED.

[0030] Even if LED stops receiving a lightwave signal since according to the optical-communication equipment of the above-mentioned operation gestalt a switching circuit is held to

an ON state with the above-mentioned maintenance means after the above-mentioned switching circuit will be in an ON state with the electrical signal from Above LED once being in an ON state with the electrical signal from LED, the ON state of a switching circuit can be maintained.
[0031]
[Embodiment of the Invention] Hereafter, the gestalt of implementation of illustration explains the power control, the receiving set for remote control, and optical-communication equipment of this invention to a detail.
[0032] (The 1st operation gestalt) Drawing 1 is the outline block diagram of the important section of the household-electric-appliances device which used the receiving set for remote control of the 1st operation gestalt of this invention.
[0033] The household-electric-appliances device using this receiving set for remote control The solid state relay 2 by which the end of a source power supply 1 was connected to the end as shown in drawing 1 (SSR), The rectifier circuit 3 where one input terminal was connected to the other end of the above-mentioned solid state relay 2, and the input terminal of another side was connected to the other end of a source power supply 1 (diode bridge), The capacitor 4 for smooth by which both ends were connected to both the output terminals of the positive/negative of the above-mentioned rectifier circuit 3, It has the primary regulator 6 by which the end was connected to the negative-electrode side output terminal of the above-mentioned rectifier circuit 3, and the power transformer 7 by which the end of a primary side coil was connected to the positive-electrode side output terminal of the above-mentioned rectifier circuit 3, and the other end of a primary side coil was connected to the other end of the above-mentioned primary regulator 6. The rectification smoothing circuit 5 consists of an above-mentioned rectifier circuit 3 and a capacitor 4 for smooth. Moreover, in in Japan, a source power supply 1 is AC100V.
[0034] Moreover, the household-electric-appliances device using the above-mentioned receiving set for remote control The diode 10 by which the anode was connected to the end of the 1st coil of the secondary of a power transformer 7, The capacitor 11 by which the end was connected to the cathode of the above-mentioned diode 10, and the other end was connected to the other end of the 1st coil of the above, The diode 12 by which the anode was connected to the end of the 2nd coil of the secondary of a power transformer 7, The capacitor 13 by which the end was connected to the cathode of the above-mentioned diode 12, and the other end was connected to the other end of the 2nd coil of the above, The low loss regulator 8 by which the input terminal was connected to the cathode of the above-mentioned diode 12, and the grand terminal was connected to the other end of the 2nd coil of the above, The input terminal was connected to the cathode of the above-mentioned diode 10, and the output terminal is equipped with the photo coupler 9 connected to the control input terminal of the primary regulator 6. The 1st rectification smoothing circuit is constituted from above-mentioned diode 10 and a capacitor 11, and the 2nd rectification smoothing circuit consists of diode 12 and a capacitor 13. Moreover, the end of DC power supply Rhine 14 is connected to the output terminal of the above-mentioned low loss regulator 8.
[0035] According to the DC power supply electrical potential difference which needs the secondary of the above-mentioned power transformer 7 in each circuit by the side of a load (not shown), only the required number of power-source Rhine (drawing 1 two) is outputted. Moreover, in order to obtain supply voltage stable irrespective of a load effect, the above-mentioned low loss regulator 8 is used for the secondary output of a power transformer 7.
[0036] The main power supply circuit 20 consists of the above-mentioned solid state relay 2, the smooth rectifier circuit 5, the primary regulator 6, a power transformer 7, the low loss regulator 8, a photo coupler 9, diode 10, a capacitor 11, diode 12, and a capacitor 13.
[0037] Furthermore, the anode of diode 21 was connected to the other end of above-mentioned DC power supply Rhine 14, and the mass capacitor 22 is connected between the cathode of diode 21, and a gland. The end of a switching circuit 23 was connected to the cathode of the above-mentioned diode 21, the other end of a switching circuit 23 was connected to the power-source input terminal of the microcomputer 32 as a maintenance means, and the remote control light-receiving unit 31, respectively, and each grand terminal of the remote control light-

receiving unit 31 is connected with the microcomputer 32 in the gland, respectively. In this way, as for a microcomputer 32 and the remote control light-receiving unit 31, power is supplied from DC power supply Rhine 14 of the secondary of a power transformer 7 through diode 21 and a switching circuit 23. The remote control light-receiving circuit 30 as a power-ed supply circuit is constituted from an above-mentioned microcomputer 32 and a remote control light-receiving unit 31, and the receiving set for remote control consists of a switching circuit 23, a microcomputer 32, and a remote control light-receiving unit 31.

[0038] At the time of actuation of a device, the switching circuit 23 is maintaining the ON state with the control signal from a microcomputer 32, and while power is supplied through diode 21 from DC power supply Rhine 14, as for the remote control light-receiving circuit 30, the mass capacitor 22 is charged.

[0039] And when stopping actuation of a device by remote control actuation of a user, the remote control light-receiving unit 31 receives the instruction by the lightwave signal from a remote control transmitter (not shown), the contents of the received instruction are judged with a microcomputer 32, and a microcomputer 32 outputs a control signal to a solid state relay 2, and makes a solid state relay 2 off. To coincidence, a microcomputer 32 ends the actuation itself. Thereby, the control signal over a switching circuit 23 stops, and a switching circuit 23 becomes off. As for a device, the electric power supplies to all the circuits of a device also including the remote control light-receiving circuit 30 are intercepted by this, and a device goes into a standby condition by it. Since the electric power supply to each circuit is intercepted in the state of this standby, power consumption becomes it is infinite and close to zero.

[0040] Moreover, drawing 2 shows the internal-circuitry block of the remote control light-receiving unit 31 shown in drawing 1 . As shown in drawing 2 , LED41 as a photo detector which has sensibility is built in the wavelength of the lightwave signal transmitted from the remote control transmitter (not shown), and this remote control light-receiving unit 31 receives the lightwave signal sent by this from the remote control transmitter, and changes it into an electrical signal. And after being amplified with the amplifier 42 connected immediately after LED41, it is band-limited by the band pass filter (BPF) 43 of the latter part of the amplifier 42, and gets over with the recovery machine 44 further, and after the changed electrical signal is shaped in waveform by the waveform shaper 45, it is sent to a microcomputer 32 (shown in drawing 1).

[0041] Moreover, the above LED 41 outputs the electrical signal which changed the lightwave signal which received light by LED41 as a control signal required for actuation of a switching circuit 23 (shown in drawing 1), when returning actuation of the device of a standby condition. Also under non-bias, the above LED 41 will generate electromotive force, if the light of the wavelength in that sensibility is received, and it uses this electromotive force as a control signal which makes a switching circuit 23 turn on.

[0042] Hereafter, the household-electric-appliances device using the receiving set for remote control of the above-mentioned configuration explains the actuation when resuming actuation from a standby condition.

[0043] If the start button (power-source ON / off-carbon button) of a remote control transmitter (not shown) of operation is pushed in order that a user may operate a household-electric-appliances device with a remote control transmitter, a lightwave signal will be transmitted from a remote control transmitter towards the remote control light-receiving unit 31 shown in drawing 1 of the body of a household-electric-appliances device.

[0044] And the lightwave signal transmitted from the remote control transmitter which is not illustrated is received by LED41 (shown in drawing 2) built in the remote control light-receiving unit 31. In LED41, by the received lightwave signal, an electrical signal occurs and this electrical signal is transmitted to a switching circuit 23 as a control signal.

[0045] A switching circuit 23 turns on by this, and the mass capacitor 22 starts discharge, that is, power is supplied to the remote control light-receiving circuit 30. A microcomputer 32 starts actuation, a control signal is outputted to a solid state relay 2 as the first instruction, and a solid state relay 2 is made to turn on by this. When the above-mentioned solid state relay 2 turns on, a power source is supplied to the whole device from the main power supply circuit 20, and the

whole device returns to operating state.
[0046] As the above-mentioned switching circuit 23 is shown in drawing 5 , it consists of NPN transistors Q1, a collector side is connected to a power-source side (mass capacitor 22), and the emitter side is connected to the load side (power supply terminal of the remote control light-receiving circuit 30). The end of resistance R1 was connected to the base of NPN transistor Q1, the anode of diode LED 1 (equivalent to LED41) was connected to the other end of resistance R1, and the cathode of diode LED 1 is connected to a gland. Power control consists of above-mentioned diode LED 1, resistance R1, and NPN transistor Q1.
[0047] Moreover, in drawing 2 , although not illustrated, the signal from a microcomputer 32 is inputted into the base of the transistor Q1 of a switching circuit 23, the transistor Q1 of a switching circuit 23 turns on with diode LED 1, and after power is supplied to the remote control light-receiving circuit 30 containing the microcomputer 32 shown in drawing 1 from the main power supply circuit 20, control is performed so that an ON state may be continued from the microcomputer 32 as a maintenance means to a switching circuit 23.
[0048] Thus, since between the remote control light-receiving circuit 30 and the mass capacitors 22 is intercepted in the above-mentioned switching circuit 23, power consumption at the time of standby of a device can be made into zero infinite. Moreover, since LED of the remote control light-receiving unit 31 which receives the lightwave signal for remote control from a transmitting side and which is a photo detector is used for the drive of a switching circuit 23, circuitry can be simplified and cost can be reduced.
[0049] Moreover, even if the remote control light-receiving unit 31 stops receiving a lightwave signal since a switching circuit 23 is held to an ON state with the microcomputer 32 as the above-mentioned maintenance means once being in an ON state with the electrical signal from the remote control light-receiving unit 31, the ON state of a switching circuit 23 can be maintained.
[0050] Although the household-electric-appliances device using the receiving set for remote control of the above-mentioned 1st operation gestalt was explained, with the application of the receiving set for remote control of this invention, a potato is good for all the electronic equipment that will be not only in a household-electric-appliances device but other standby conditions.
[0051] (The 2nd operation gestalt) Drawing 3 is the outline block diagram of the optical-communication equipment of the 2nd operation gestalt of this invention. As shown in drawing 3 , common LED is being used for this optical-communication equipment as a transceiver component of a lightwave signal. That is, LED is used as an application of both a light emitting device and a photo detector.
[0052] Hereafter, actuation in case the above-mentioned optical-communication equipment resumes actuation from a standby condition is explained.
[0053] While the lightwave signal Lr1 transmitted from LED60 of the above-mentioned optical-communication equipment 50 is received with another optical-communication equipment 70 which has the same function as optical-communication equipment 80, the lightwave signal Lr2 conversely transmitted from optical-communication equipment 70 is received by LED60 of optical-communication equipment 50. By doing so, two-way communication by the lightwave signal is performed between optical-communication equipment 50 and optical-communication equipment 70.
[0054] LED60 of the above-mentioned optical-communication equipment 50 changes the electrical signal from the drive circuit 59 into a lightwave signal at the time of lightwave signal transmission (luminescence), and changes the lightwave signal Lr2 from optical-communication equipment 70 into an electrical signal at the time of lightwave signal reception. At this time, the Tx/Rx circuit changing switch 63 was operated with the high level or low level of a control signal outputted from CPU53, and LED60 is changed to luminescence mode and light-receiving mode. That is, LED60 makes LED60 luminescence mode, when transmitting a lightwave signal, and when receiving a lightwave signal, it does not transmit [LED] by making LED60 into light-receiving mode and receive to coincidence. This is performing two-way communication of a half duplex by one LED60 (depending on the case, two or more LED may be used [the case where he wants to

obtain a large angle of beam spread, and] as a lot to obtain stronger optical reinforcement).
[0055] When data are transmitted, after the data stored in RAM56 are transmitted to UART57 and changed into serial data from parallel data by UART57 by control of CPU53 based on the program of ROM55, it is transmitted to the modulation machine 58. And the signal modulated with the modulation machine 58 is sent out as a lightwave signal Lr1 from LED60 through the drive circuit 59. At this time, LED60 serves as luminescence mode with the Tx/Rx circuit changing switch 63 controlled by the control signal from CPU53.
[0056] On the other hand, when receiving data, in response to the lightwave signal Lr2 transmitted from optical-communication equipment 70, it changes into an electrical signal by LED60 of optical-communication equipment 80. And the signal changed into the electrical signal is further transmitted to UART57, after being transmitted to the recovery machine 62 after being amplified with an amplifier 61, and getting over to serial data with the recovery machine 62. Then, data store data in RAM56 by control of CPU53 based on the program of ROM55, after being changed into parallel data by UART57. At this time, LED60 serves as the receive mode with the Tx/Rx circuit changing switch 63 controlled by the control signal from CPU53.
[0057] Functional block of the above CPU53, ROM55, RAM56, and UART57, the modulation machine 58, and the recovery machine 62 consists of LSI71 as a power-ed supply circuit of one chip. Moreover, the optical transceiver unit 72 which served as the power-ed supply circuit consists of an above-mentioned drive circuit 59, LED60, and amplifier 61.
[0058] If a certain fixed time amount communication link breaks off between the above-mentioned optical-communication equipment 50 and optical-communication equipment 70, optical-communication equipment 50 and optical-communication equipment 70 will go into a standby condition by control of CPU53. After CPU53 ends that actuation at this time, the control signal over a switching circuit 52 stops in coincidence, and a switching circuit 52 becomes off. Consequently, the dc-battery 51 of optical-communication equipment 50 is separated from each circuit, and consumption of a dc-battery becomes it is infinite and close to zero.
[0059] And when the optical-communication equipment 50 in a standby condition re-starts a power source by the appeal from another optical-communication equipment 70, LED60 in a non-bias condition receives the lightwave signal from optical-communication equipment 70, this is changed into an electrical signal, and the changed electrical signal is sent to a switching circuit 52 as a control signal which turns on a switching circuit 52. And if a switching circuit 52 receives the control signal from LED60, a switching circuit 52 will be in an ON state, and power will be supplied to each circuit from a dc-battery 51. Thereby, CPU53 as a maintenance means resumes actuation, and a control signal is outputted to a switching circuit 52 so that the ON state of a switching circuit 52 may be continued as the first actuation.
[0060] Thus, since between a dc-battery 51 and each circuit is intercepted in the above-mentioned switching circuit 52, power consumption at the time of standby can be made into zero infinite. Moreover, since LED60 which is the photo detector for a communication link which receives the lightwave signal from a transmitting side is used for the drive of a switching circuit 52, circuitry can be simplified and cost can be reduced. Moreover, the dc-battery consumption at the time of standby is sharply improvable.
[0061] Moreover, even if LED60 stops receiving a lightwave signal since a switching circuit 52 is held to an ON state by CPU53 as the above-mentioned maintenance means once being in an ON state with the electrical signal from LED60, the ON state of a switching circuit 52 can be maintained.
[0062] (The 3rd operation gestalt) Drawing 4 is the outline block diagram of the optical-communication equipment of the 3rd operation gestalt of this invention. As this optical-communication equipment is shown in drawing 4 , only for power-source starting of the optical-communication equipment in a standby condition, it is what carried LED40 for light-receiving, and the same configuration as the optical-communication equipment of the 2nd operation gestalt is carried out except for LED40 for light-receiving, and the same configuration section attaches the same reference number, and omits explanation. In addition, while constituting functional block of the above CPU53, ROM55, RAM56, and UART57, the modulation machine 58, and the

recovery machine 62 from LSI71 as a power-ed supply circuit of one chip, the optical transceiver unit 82 consists of a drive circuit 59, LED81, and amplifier 61.

[0063] In the optical-communication equipment 80 shown in drawing 4 , when the optical-communication equipment in a standby condition re-starts a power source by remote control actuation, LED40 in a non-bias condition receives the lightwave signal from the optical-communication equipment 70 of a transmitting side, this is changed into an electrical signal, and the changed electrical signal is sent to a switching circuit 52 as a control signal which turns on a switching circuit 52. And if a switching circuit 52 receives the control signal from LED40, a switching circuit 52 will be in an ON state, and power will be supplied to each circuit from a dc-battery 51. Thereby, CPU53 as a maintenance means resumes actuation, and a control signal is outputted to a switching circuit 52 so that the ON state of a switching circuit 52 may be continued as actuation of the beginning of CPU53.

[0064] Thus, since between a dc-battery 51 and each circuit is intercepted in the above-mentioned switching circuit 52, power consumption at the time of standby can be made into zero infinite. Moreover, since power control is constituted from LED40 and a switching circuit 52, circuitry can be simplified and cost can be reduced. Moreover, the dc-battery consumption at the time of standby is sharply improvable.

[0065] Moreover, even if LED40 stops receiving a lightwave signal since a switching circuit 52 is held to an ON state by CPU53 as the above-mentioned maintenance means once being in an ON state with the electrical signal from LED40, the ON state of a switching circuit 52 can be maintained.

[0066] Of course in the power control of this invention, you may apply not only to the receiving set for remote control, or optical-communication equipment but to all other electronic equipment.

[0067] Although the above-mentioned 2nd and 3rd operation gestalt explained the optical-communication equipment which performs bidirectional optical communication, this invention may be applied to the receiving side of optical-communication equipment which performs optical communication of an one direction.

[0068] Moreover, although the microcomputer 32 and CPU53 were used as a maintenance means, a maintenance means may constitute not only this but a switching circuit from the above 1st - a 3rd operation gestalt in other circuits which can be held to an ON state.

[Translation done.]

* NOTICES *

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing 1 is the outline block diagram of the important section of the household-electric-appliances device which used the receiving set for remote control of the 1st operation gestalt of this invention.
[Drawing 2] Drawing 2 is the internal-block Fig. of the remote control light-receiving unit of the above-mentioned receiving set for remote control.
[Drawing 3] Drawing 3 is the block diagram of the optical-communication equipment of the 2nd operation gestalt of this invention.
[Drawing 4] Drawing 4 is the block diagram of the optical-communication equipment of the 3rd operation gestalt of this invention.
[Drawing 5] Drawing 5 is the circuit diagram of the power control of this invention.
[Drawing 6] Drawing 6 is the outline block diagram of the important section of the household-electric-appliances device using the conventional receiving set for remote control.
[Drawing 7] Drawing 7 is the outline block diagram of the important section of the household-electric-appliances device using other conventional receiving sets for remote control.
[Drawing 8] Drawing 8 is the block diagram of conventional optical-communication equipment.
[Description of Notations]
1 -- Source power supply,
2 -- Solid state relay,
3 -- Rectifier circuit,
4, 11, 13 -- Capacitor for smooth,
5 -- Rectification smoothing circuit,
6 -- Primary regulator,
7 -- Power transformer
8 -- Low loss regulator,
9 -- Photo coupler,
10, 12, 21 -- Diode,
14 -- DC power supply Rhine,
20 -- Power circuit,
22 -- Mass capacitor,
23 -- Switching circuit
30 -- Remote control light-receiving circuit,
31 -- Remote control light-receiving unit,
32 -- Microcomputer,
41 -- LED,
42 -- Amplifier,
43 -- Band pass filter,
44 -- Recovery machine,
45 -- Corrugating section,
50, 70, 80 -- Optical-communication equipment,
51 -- Dc-battery,

52 -- Switching circuit
53 -- CPU,
54 -- Signal bus,
55 -- ROM,
56 -- RAM,
57 -- UART,
58 -- Modulation machine,
59 -- Drive circuit,
40, 60, 81 -- LED,
61 -- Amplifier,
62 -- Recovery machine,
63 -- Tx/Rx circuit changing switch,
71 -- LSI,
72 82 -- Optical transceiver unit.

[Translation done.]

* NOTICES *

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WRITTEN AMENDMENT

---------- [a procedure revision]
[Filing Date] August 10, Heisei 12 (2000. 8.10)
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] 0053
[Method of Amendment] Modification
[Proposed Amendment]
[0053] While the lightwave signal Lr1 transmitted from LED60 of the above-mentioned optical-communication equipment 50 is received with another optical-communication equipment 70 which has the same function as optical-communication equipment 50, the lightwave signal Lr2 conversely transmitted from optical-communication equipment 70 is received by LED60 of optical-communication equipment 50. By doing so, two-way communication by the lightwave signal is performed between optical-communication equipment 50 and optical-communication equipment 70.
[Procedure amendment 2]
[Document to be Amended] Specification
[Item(s) to be Amended] 0056
[Method of Amendment] Modification
[Proposed Amendment]
[0056] On the other hand, when receiving data, in response to the lightwave signal Lr2 transmitted from optical-communication equipment 70, it changes into an electrical signal by LED60 of optical-communication equipment 50. And the signal changed into the electrical signal is further transmitted to UART57, after being transmitted to the recovery machine 62 after being amplified with an amplifier 61, and getting over to serial data with the recovery machine 62. Then, data store data in RAM56 by control of CPU53 based on the program of ROM55, after being changed into parallel data by UART57. At this time, LED60 serves as the receive mode with the Tx/Rx circuit changing switch 63 controlled by the control signal from CPU53.

[Translation done.]

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2002－26812
（P2002－26812A）
(43)公開日　平成14年１月25日(2002.1.25)

(51)Int.Cl.⁷	識別記号	FI		テーマコード（参考）
Ｈ０４Ｂ　10/00		Ｈ０２Ｊ　1/00		３０７Ｃ　５Ｇ０６５
Ｈ０２Ｊ　1/00	３０７	Ｈ０４Ｑ　9/00		３０１Ａ　５Ｋ００２
Ｈ０４Ｑ　9/00	３０１			３０１Ｅ　５Ｋ０４８
				３４１Ｂ
	３４１	Ｈ０４Ｂ　9/00		Ｐ

審査請求　未請求　請求項の数６　ＯＬ　（全 12 頁）

(21)出願番号　特願2000－203874(P2000－203874)

(22)出願日　平成12年７月５日(2000.7.5)

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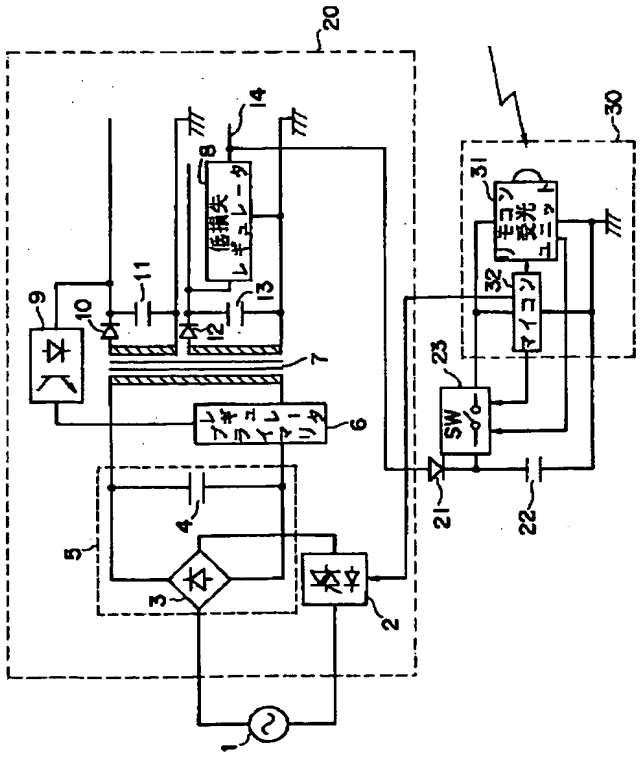
最終頁に続く

(54)【発明の名称】　電源制御装置およびリモコン用受信装置および光通信装置

(57)【要約】
【課題】　待機時の消費電力を限りなくゼロにできると共に、バッテリー駆動において待機時のバッテリー消耗を大幅に改善できる電源制御装置およびリモコン用受信装置および光通信装置を提供する。
【解決手段】　ソリッドステートリレー２がオフ状態の待機時、機器のリモコン受光回路３０と大容量コンデンサ２２との間に接続されたスイッチ回路２３をオフ状態にして、リモコン受光回路３０への電力供給を遮断する。そして、上記スイッチ回路２３がオフ状態のときに、送信側からの遠隔制御用の光信号を受信する受光素子であるリモコン受光回路３０のＬＥＤが無バイアス状態で光信号を検出すると、制御信号を出力してスイッチ回路２３をオン状態にし、大容量コンデンサ２２からリモコン受光回路３０に電力を供給する。



【特許請求の範囲】

【請求項１】　機器に搭載される電源制御装置であって、

上記機器の被電力供給回路と電源との間に接続され、上記機器の待機時にオフ状態となるスイッチ回路と、

無バイアス状態で光信号を検出すると、上記スイッチ回路をオン状態にする電気信号を出力するＬＥＤとを備えたことを特徴とする電源制御装置。

【請求項２】　請求項１に記載の電源制御装置において、

上記ＬＥＤからの上記電気信号により上記スイッチ回路がオン状態になると、上記スイッチ回路をオン状態に保持する保持手段を備えたことを特徴とする電源制御装置。

【請求項３】　機器に搭載され、送信側からの遠隔制御用の光信号を受信する受光素子としてＬＥＤが用いられたリモコン用受信装置において、

上記機器の被電力供給回路と電源との間に接続され、上記機器の待機時にオフ状態となるスイッチ回路を備え、

上記ＬＥＤは、無バイアス状態で光信号を検出すると、上記スイッチ回路をオン状態にする電気信号を出力することを特徴とするリモコン用受信装置。

【請求項４】　請求項３に記載のリモコン用受信装置において、

上記ＬＥＤからの上記電気信号により上記スイッチ回路がオン状態になると、上記スイッチ回路をオン状態に保持する保持手段を備えたことを特徴とするリモコン用受信装置。

【請求項５】　送信側からの光信号を受信する受光素子としてＬＥＤが用いられた光通信装置において、

被電力供給回路と電源との間に接続され、待機時にオフ状態となるスイッチ回路と、

無バイアス状態で光信号を検出すると、上記スイッチ回路をオン状態にする電気信号を出力するＬＥＤとを備えたことを特徴とする光通信装置。

【請求項６】　請求項５に記載の光通信装置において、

上記ＬＥＤからの上記電気信号により上記スイッチ回路がオン状態になると、上記スイッチ回路をオン状態に保持する保持手段を備えたことを特徴とする光通信装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】この発明は、家電機器等の電源を制御する電源制御装置およびリモコン(リモートコントロール装置)からの遠隔制御用光信号を受信するリモコン用受信装置および光通信を行う光通信装置に関する。

【０００２】

【従来の技術】従来、リモコン用受信装置としては、一般的な家電機器に搭載され、その電源回路のオン(動作状態)／オフ(待機状態)を制御するものがある。

【０００３】図６は上記リモコン用受信装置を用いた家電機器の要部の概略構成図を示しており、ＡＣ(交流)１００Ｖの商用電源１にソリッドステートリレー(ＳＳＲ)２を介して接続された整流平滑回路５(整流回路３，平滑用コンデンサ４)と、プライマリレギュレータ６とを電源トランス７の１次側に設け、ダイオード１０，コンデンサ１１からなる第１整流平滑回路と、ダイオード１２，コンデンサ１３からなる第２整流平滑回路とを電源トランス７の２次側に設けている。上記第１整流平滑回路の出力をフォトカプラ９の入力側に接続し、フォトカプラ９の出力側をプライマリレギュレータ６に接続している。また、上記第２整流平滑回路の出力側に低損失レギュレータ８を使用して、安定した電源電圧で電力を供給する。上記ソリッドステートリレー２，平滑整流回路５，プライマリレギュレータ６，電源トランス７，低損失レギュレータ８，フォトカプラ９，ダイオード１０，コンデンサ１１，ダイオード１２およびコンデンサ１３で主電源回路２０を構成している。また、上記待機用電源トランス１０９，整流平滑回路１１０および低損失レギュレータ１１１で補助電源回路１１２を構成し、リモコン受光ユニット１１３，マイクロコンピュータ(以下、マイコンという)１１４でリモコン受光回路１１５を構成している。

【０００４】上記リモコン用受信装置を用いた家電機器では、図６に示すように、待機時、補助電源回路１１２によって、リモコン受光回路１１５に電力が供給されている。このとき、ソリッドステートリレー２がオフ状態となっているため、主電源回路２０への電力供給が遮断されている。

【０００５】そして、使用者がリモコン操作によって機器の電源をオンさせようとすると、リモコン送信機から送信された光信号をリモコン受光ユニット１１３が受信し、リモコン受光ユニット１１３により検出された電気信号によってマイコン１１４がソリッドステートリレー２に対して制御信号を出力して、ソリッドステートリレー２をオン状態にする。そうして、商用電源１が接続された主電源回路２０から各回路全体に電力が供給され、家電機器が動作状態に入る。

【０００６】逆に、動作状態から使用者がリモコン操作によって家電機器の動作を止めるときは、同じくリモコン送信機から送信された光信号をリモコン受光ユニット１１３が受信し、リモコン受光ユニット１１３により検出された動作停止の命令を表す電気信号によってマイコン１１４がソリッドステートリレー２に対して制御信号を出力して、ソリッドステートリレー２がオフ状態となる。そうすると、主電源回路２０と商用電源１との間の電力供給ラインが遮断され、家電機器は動作停止状態、つまり待機状態となる。この待機状態では、上記補助電源回路１１２によりマイコン１１４，リモコン受光回路１１５に電力が供給されて動作を続けるので、わずかな

がらも電力を消費し続ける。

【０００７】また、他のリモコン用受信装置としては、一般的な家電機器に搭載され、その電源回路のオン(動作状態)／オフ(待機状態)を制御するものであって、動作時に充電された大容量コンデンサを待機時に補助電源として用いるものがある。

【０００８】図７は上記リモコン用受信装置を用いた家電機器の要部の概略構成図を示しており、このリモコン用受信装置は、図６に示す補助電源回路１１２の代わりに大容量コンデンサ(大容量の電解コンデンサまたはスーパーキャパシタ)１２２をリモコン受光回路２１５の補助電源としている。上記大容量コンデンサ１２２は、低損失レギュレータ８の出力にダイオード１２１を介して接続されている。

【０００９】図７に示すマイコン２１４とリモコン受光ユニット２１３からなるリモコン受光回路２１５は、図６の場合と同じく待機時においても、リモコン送信機から送られてくる光信号を受信するために常時動作状態である必要がある。また、動作時は、リモコン受光回路２１５は、主電源回路２０のＤＣ電源ライン１４から電力が供給され、同時に大容量コンデンサ１２２は、ＤＣ電源ライン１４,ダイオード１２１を介して充電される。

【００１０】上記リモコン用受信装置において、使用者のリモコン操作によって家電機器の動作を止める場合、図６と同じくリモコン受光ユニット２１３がリモコン送信機からの光信号による命令を受信し、その内容をマイコン２１４で判断して、マイコン２１４がソリッドステートリレー２に対して制御信号を出力し、ソリッドステートリレー２をオフ状態とする。そして、上記ソリッドステートリレー２がオフ状態となった後は、ＤＣ電源ライン１４の電圧はゼロとなるので、大容量コンデンサ１２２が放電を開始し、大容量コンデンサ１２２がリモコン受光回路２１５の電源として使われる。

【００１１】また、待機時間が長くなると、大容量コンデンサ１２２の充電量が足らなくなるので、マイコン２１４で、大容量コンデンサ１２２から供給される電圧をモニターし、ある電圧レベル以下になった場合は、マイコン２１４がソリッドステートリレー２に対して制御信号を出力し、ソリッドステートリレー２をオンさせることによって再度大容量コンデンサ１２２を充電する動作を行う。そして、大容量コンデンサ１２２の充電を完了後、再びソリッドステートリレー２がオフとなるようにマイコン２１４がソリッドステートリレー２に対して制御信号を出力する。したがって、定期的に主電源回路２０のオン／オフを繰り返すため、その度に電力を消費する。

【００１２】また、光通信装置としては、双方向の通信が可能な携帯型のものがある。上記光通信装置は、図８に示すように、バッテリー１５１を搭載しており、これを電源として使用している。この双方向通信を行う光通信装置では、送受信を１つのＬＥＤで兼用している。

【００１３】上記光通信装置１５０に搭載されているＣＰＵ(中央処理装置)１５３に、信号バス１５４を介してＣＰＵ１５３の動作に必要なプログラムが書き込まれたＲＯＭ(リード・オンリー・メモリー)１５５と、送受信データの蓄積等に使用するＲＡＭ(ランダム・アクセス・メモリー)１５６と、データのパラレル／シリアル変換等を行うＵＡＲＴ(Universal Asynchronous Receiver Ttansmitter)１５７とを接続している。上記ＵＡＲＴ１５７の出力に、そのＵＡＲＴ１５７から出力されるシリアルデータの変調を行うための変調機１５８と、ＬＥＤ１６０を駆動する駆動回路１５９と、光信号Ｌr1を送出するＬＥＤ１６０とを順に接続している。上記ＬＥＤ１６０は、受光素子として受けた光信号Ｌr2を電気信号に変換する。このＬＥＤ１６０の出力に、その出力を増幅するための増幅器１６１と、その増幅器１６１の出力信号を復調してシリアルデータ信号に変換する復調機１６２とを順に接続し、復調機１６２の出力をＵＡＲＴ１５７の入力端子に接続している。上記ＣＰＵ１５３,ＲＯＭ１５５,ＲＡＭ１５６,ＵＡＲＴ１５７,変調機１５８および復調機１６２の機能ブロックを１チップのＬＳＩ１７１で構成している。

【００１４】上記構成の光通信装置１５０において、ＬＥＤ１６０から送信された光信号Ｌr1は、光通信装置１５０と同じ機能を有する別の光通信装置１７０で受光されると共に、逆に光通信装置１７０から送信された光信号Ｌr2は、光通信装置１５０のＬＥＤ１６０で受信される。そうすることによって、光通信装置１５０と光通信装置１７０との間で光信号による双方向通信を行う。なお、上記ＬＥＤ１６０は、送信(発光)モードと受信(受光)モードをＴx／Ｒx切替スイッチ１６３で切り替えて使用し、Ｔx／Ｒx切替スイッチ１６３の切替動作をＣＰＵ１５３により制御している。

【００１５】

【発明が解決しようとする課題】ところが、図６,図７に示すリモコン用受信装置では、機器の待機時においても、次のリモコン送信機等からの命令を受信して実行するために、マイコン１１４,２１４とリモコン受光ユニット１１３,２１３を動作状態にしておく必要があり、待機時に電力を消費し続けるという問題がある。

【００１６】また、図８に示すバッテリー１５１を電源として用いる光通信装置１５０,１７０では、通信が終わって待機状態となった後、いつ通信相手からの光信号を受信して動作を再開しなければならないのか予測できないため、受信体制を常時整えておく必要がある。したがって、上記光通信装置１５０,１７０では、待機時にＣＰＵ１５３の一部機能とリモコン受光ユニット１７２の機能を働かせる必要があるため、バッテリー１５１を消耗し続けるという問題がある。

【００１７】特に、家電機器では、実際に使用している

時間よりも、待機中の時間の方が長く、待機時の消費電力の削減があらゆる家電機器の共通の課題となっている。

【００１８】そこで、この発明の目的は、待機時の消費電力を限りなくゼロにできると共に、バッテリー駆動において待機時のバッテリー消耗を大幅に改善できる電源制御装置およびリモコン用受信装置および光通信装置を提供することにある。

【００１９】

【課題を解決するための手段】上記目的を達成するため、この発明の電源制御装置は、機器に搭載される電源制御装置であって、上記機器の被電力供給回路と電源との間に接続され、上記機器の待機時にオフ状態となるスイッチ回路と、無バイアス状態で光信号を検出すると、上記スイッチ回路をオン状態にする電気信号を出力するＬＥＤ(Light Emitting Diode)とを備えたことを特徴としている。

【００２０】上記構成の電源制御装置によれば、上記電源から電力供給を受ける被電力供給回路と電源との間に接続された上記スイッチ回路を上記機器の待機時にオフ状態にする。この待機中に、上記無バイアス状態のＬＥＤが外部から光信号(ＬＥＤが感度を有する波長の光)を受けると、ＬＥＤは起電力を生じ、上記スイッチ回路をオン状態にする電気信号を出力する。そうして、上記スイッチ回路がオン状態になると、上記電源から上記被電力供給回路に電力が供給されて、機器が動作状態となる。したがって、機器の待機時にスイッチ回路で被電力供給回路と電源との間を遮断するので、待機時の消費電力を限りなくゼロにできる。特に、電源がバッテリーの携帯型機器では、被電力供給回路とバッテリーとの間をスイッチ回路で遮断するので、待機時のバッテリー消耗を大幅に改善できる。

【００２１】また、一実施形態の電源制御装置は、上記ＬＥＤからの上記電気信号により上記スイッチ回路がオン状態になると、上記スイッチ回路をオン状態に保持する保持手段を備えたことを特徴としている。

【００２２】上記実施形態の電源制御装置によれば、上記ＬＥＤからの電気信号により上記スイッチ回路がオン状態となった後に上記保持手段によりスイッチ回路をオン状態に保持するので、一旦ＬＥＤからの電気信号によりオン状態となった後にＬＥＤが光信号を受信しなくなっても、スイッチ回路のオン状態を保つことができる。

【００２３】また、この発明のリモコン用受信装置は、機器に搭載され、送信側からの遠隔制御用の光信号を受信する受光素子としてＬＥＤが用いられたリモコン用受信装置において、上記機器の被電力供給回路と電源との間に接続され、上記機器の待機時にオフ状態となるスイッチ回路を備え、上記ＬＥＤは、無バイアス状態で光信号を検出すると、上記スイッチ回路をオン状態にする電気信号を出力することを特徴としている。

【００２４】上記構成のリモコン用受信装置によれば、上記機器の被電力供給回路と電源との間に接続されたスイッチ回路を上記機器の待機時にオフ状態にする。この待機中に、受光素子である上記ＬＥＤが無バイアス状態で送信側(リモコン送信機等)から光信号(ＬＥＤが感度を有する波長の光)を受けると、ＬＥＤは起電力を生じ、上記スイッチ回路をオン状態にする電気信号を出力する。そうして、上記スイッチ回路がオン状態になると、上記電源から上記被電力供給回路に電力が供給されて、機器が動作状態となる。したがって、待機時にスイッチ回路で被電力供給回路と電源との間を遮断するので、待機時の消費電力を限りなくゼロにできる。また、送信側からの遠隔制御用の光信号を受信する受光素子であるＬＥＤをスイッチ回路の駆動用に用いるので、回路構成を簡略化でき、コストを低減できる。特に、電源がバッテリーの携帯型機器では、被電力供給回路とバッテリーとの間をスイッチ回路で遮断することによって、待機時のバッテリー消耗を大幅に改善できる。

【００２５】また、一実施形態のリモコン用受信装置は、上記ＬＥＤからの上記電気信号により上記スイッチ回路がオン状態になると、上記スイッチ回路をオン状態に保持する保持手段を備えたことを特徴としている。

【００２６】上記実施形態のリモコン用受信装置によれば、上記ＬＥＤからの電気信号により上記スイッチ回路がオン状態となった後に上記保持手段によりスイッチ回路をオン状態に保持するので、一旦ＬＥＤからの電気信号によりオン状態となった後にＬＥＤが光信号を受信しなくなっても、スイッチ回路のオン状態を保つことができる。

【００２７】また、この発明の光通信装置は、送信側からの光信号を受信する受光素子としてＬＥＤが用いられた光通信装置において、被電力供給回路と電源との間に接続され、待機時にオフ状態となるスイッチ回路と、無バイアス状態で光信号を検出すると、上記スイッチ回路をオン状態にする電気信号を出力するＬＥＤとを備えたことを特徴としている。

【００２８】上記構成の光通信装置によれば、上記被電力供給回路と電源との間に接続されたスイッチ回路を待機時にオフ状態にする。この待機中に、通信用受光素子である上記ＬＥＤが無バイアス状態で送信側から光信号(ＬＥＤが感度を有する波長の光)を受けると、ＬＥＤは起電力を生じ、上記スイッチ回路をオン状態にする電気信号を出力する。そうして、上記スイッチ回路がオン状態になると、上記電源から上記被電力供給回路に電力が供給されて、この光通信装置が動作状態となる。したがって、待機時にスイッチ回路で被電力供給回路と電源との間を遮断するので、待機時の消費電力を限りなくゼロにできる。また、送信側からの光信号を受信する通信用受光素子であるＬＥＤをスイッチ回路の駆動用に用いるので、回路構成を簡略化でき、コストを低減できる。特

に、電源がバッテリーの携帯型機器では、被電力供給回路とバッテリーとの間をスイッチ回路で遮断することによって、待機時のバッテリー消耗を大幅に改善できる。なお、この光通信装置は、双方向の光通信を行うものでもよいし、一方向のみの光通信を行うものでもよく、一方向光通信の場合は、受信側にこの発明を適用する。

【００２９】また、一実施形態の光通信装置は、上記ＬＥＤからの上記電気信号により上記スイッチ回路がオン状態になると、上記スイッチ回路をオン状態に保持する保持手段を備えたことを特徴としている。

【００３０】上記実施形態の光通信装置によれば、上記ＬＥＤからの電気信号により上記スイッチ回路がオン状態となった後に上記保持手段によりスイッチ回路をオン状態に保持するので、一旦ＬＥＤからの電気信号によりオン状態となった後にＬＥＤが光信号を受信しなくなっても、スイッチ回路のオン状態を保つことができる。

【００３１】

【発明の実施の形態】以下、この発明の電源制御装置およびリモコン用受信装置および光通信装置を図示の実施の形態により詳細に説明する。

【００３２】（第１実施形態）図１はこの発明の第１実施形態のリモコン用受信装置を用いた家電機器の要部の概略構成図である。

【００３３】このリモコン用受信装置を用いた家電機器は、図１に示すように、商用電源１の一端が一端に接続されたソリッドステートリレー（ＳＳＲ）２と、上記ソリッドステートリレー２の他端に一方の入力端子が接続され、他方の入力端子が商用電源１の他端に接続された整流回路（ダイオードブリッジ）３と、上記整流回路３の正負の両出力端子に両端が接続された平滑用コンデンサ４と、上記整流回路３の負極側出力端子に一端が接続されたプライマリレギュレータ６と、上記整流回路３の正極側出力端子に１次側巻線の一端が接続され、上記プライマリレギュレータ６の他端に１次側巻線の他端が接続された電源トランス７とを備えている。上記整流回路３と平滑用コンデンサ４で整流平滑回路５を構成している。また、商用電源１は、日本国内の場合、ＡＣ１００Ｖである。

【００３４】また、上記リモコン用受信装置を用いた家電機器は、電源トランス７の２次側の第１巻線の一端にアノードが接続されたダイオード１０と、上記ダイオード１０のカソードに一端が接続され、他端が上記第１巻線の他端に接続されたコンデンサ１１と、電源トランス７の２次側の第２巻線の一端にアノードが接続されたダイオード１２と、上記ダイオード１２のカソードに一端が接続され、他端が上記第２巻線の他端に接続されたコンデンサ１３と、上記ダイオード１２のカソードに入力端子が接続され、グランド端子が上記第２巻線の他端に接続された低損失レギュレータ８と、上記ダイオード１０のカソードに入力端子が接続され、出力端子がプライマリレギュレータ６の制御入力端子に接続されたフォトカプラ９とを備えている。上記ダイオード１０とコンデンサ１１で第１整流平滑回路を構成し、ダイオード１２とコンデンサ１３で第２整流平滑回路を構成している。また、上記低損失レギュレータ８の出力端子にＤＣ電源ライン１４の一端を接続している。

【００３５】上記電源トランス７の２次側は、負荷側の各回路（図示せず）で必要なＤＣ電源電圧に合わせて必要な電源ライン数（図１では２つ）だけ出力されるようになっている。また、負荷変動にかかわらず、安定な電源電圧を得るために、電源トランス７の２次側出力に上記低損失レギュレータ８を使用している。

【００３６】上記ソリッドステートリレー２，平滑整流回路５，プライマリレギュレータ６，電源トランス７，低損失レギュレータ８，フォトカプラ９，ダイオード１０，コンデンサ１１，ダイオード１２およびコンデンサ１３で主電源回路２０を構成している。

【００３７】さらに、上記ＤＣ電源ライン１４の他端にダイオード２１のアノードを接続し、ダイオード２１のカソードとグランドとの間に大容量コンデンサ２２を接続している。上記ダイオード２１のカソードにスイッチ回路２３の一端を接続し、スイッチ回路２３の他端を、保持手段としてのマイコン３２とリモコン受光ユニット３１の電源入力端子に夫々接続し、マイコン３２とリモコン受光ユニット３１の各グランド端子をグランドに夫々接続している。こうして、マイコン３２とリモコン受光ユニット３１は、ダイオード２１とスイッチ回路２３を介して電源トランス７の２次側のＤＣ電源ライン１４から電力が供給される。上記マイコン３２とリモコン受光ユニット３１で被電力供給回路としてのリモコン受光回路３０を構成し、スイッチ回路２３，マイコン３２およびリモコン受光ユニット３１でリモコン用受信装置を構成している。

【００３８】機器の動作時は、スイッチ回路２３は、マイコン３２からの制御信号によりオン状態を保っており、リモコン受光回路３０は、ＤＣ電源ライン１４からダイオード２１を介して電力が供給されると共に、大容量コンデンサ２２が充電される。

【００３９】そして、使用者のリモコン操作によって機器の動作を止める場合は、リモコン受光ユニット３１がリモコン送信機（図示せず）からの光信号による命令を受信し、受信された命令の内容をマイコン３２で判断して、マイコン３２がソリッドステートリレー２に対して制御信号を出力し、ソリッドステートリレー２をオフとする。同時に、マイコン３２は自らその動作を終了する。これにより、スイッチ回路２３に対する制御信号が途絶え、スイッチ回路２３はオフとなる。これによって機器はリモコン受光回路３０も含めて機器の全ての回路への電力供給が遮断され、機器は待機状態に入る。この待機状態では、各回路への電力供給が遮断されているた

め、消費電力は限りなくゼロに近くなる。

【００４０】また、図２は図１に示すリモコン受光ユニット３１の内部回路ブロックを示している。このリモコン受光ユニット３１は、図２に示すように、リモコン送信機(図示せず)からの送信された光信号の波長に感度を有する受光素子としてのＬＥＤ４１が内蔵され、これによってリモコン送信機から送られてきた光信号を受光して、電気信号に変換する。そして、変換された電気信号は、ＬＥＤ４１の直後に接続されている増幅器４２で増幅された後、その増幅器４２の後段のバンドパスフィルタ(ＢＰＦ)４３で帯域制限され、さらに復調機４４で復調し、波形整形器４５で波形整形された後、マイコン３２(図１に示す)に送られる。

【００４１】また、上記ＬＥＤ４１は、待機状態の機器の動作を復帰させるときにＬＥＤ４１で受光した光信号を変換した電気信号をスイッチ回路２３(図１に示す)の動作に必要な制御信号として出力する。上記ＬＥＤ４１は、無バイアス下でも、その感度内の波長の光を受光すると起電力を発生し、この起電力をスイッチ回路２３をオンさせる制御信号として利用する。

【００４２】以下、上記構成のリモコン用受信装置を用いた家電機器が、待機状態から動作を再開するときの動作について説明する。

【００４３】使用者がリモコン送信機によって家電機器を動作させるために、リモコン送信機(図示せず)の動作スタートボタン(電源オン／オフボタン)を押すと、リモコン送信機から、家電機器本体の図１に示すリモコン受光ユニット３１に向けて光信号が送信される。

【００４４】そして、図示しないリモコン送信機から送信された光信号は、リモコン受光ユニット３１に内蔵されているＬＥＤ４１(図２に示す)で受信する。ＬＥＤ４１では、受信した光信号によって電気信号が発生し、この電気信号がスイッチ回路２３に制御信号として伝送される。

【００４５】これによってスイッチ回路２３がオンし、大容量コンデンサ２２が放電を開始し、つまり、リモコン受光回路３０に電力が供給される。これによって、マイコン３２が動作を開始し、その最初の命令として、ソリッドステートリレー２に対して制御信号を出力し、ソリッドステートリレー２をオンさせる。上記ソリッドステートリレー２がオンすることによって、主電源回路２０から電源が機器全体に供給され、機器全体が動作状態に復帰する。

【００４６】上記スイッチ回路２３は、図５に示すように、ＮＰＮトランジスタQ1で構成され、コレクタ側が電源側(大容量コンデンサ２２)に接続され、エミッタ側が負荷側(リモコン受光回路３０の電源端子)に接続されている。ＮＰＮトランジスタQ1のベースに抵抗Ｒ1の一端が接続され、抵抗Ｒ1の他端にダイオードＬＥＤ1(ＬＥＤ４１に相当)のアノードを接続し、ダイオードＬＥＤ1のカソードをグランドに接続している。上記ダイオードＬＥＤ１,抵抗Ｒ1およびＮＰＮトランジスタQ1で電源制御装置を構成している。

【００４７】また、図２では図示していないがマイコン３２からの信号は、スイッチ回路２３のトランジスタQ1のベースに入力されており、ダイオードＬＥＤ1によってスイッチ回路２３のトランジスタQ1がオンし、図１に示すマイコン３２を含むリモコン受光回路３０に主電源回路２０から電力が供給された後、保持手段としてのマイコン３２からスイッチ回路２３に対してオン状態を継続するように制御が行われる。

【００４８】このように、上記スイッチ回路２３でリモコン受光回路３０と大容量コンデンサ２２との間を遮断するので、機器の待機時の消費電力を限りなくゼロにすることができる。また、送信側からの遠隔制御用の光信号を受信する受光素子であるリモコン受光ユニット３１のＬＥＤをスイッチ回路２３の駆動用に用いるので、回路構成を簡略化でき、コストを低減することができる。

【００４９】また、上記保持手段としてのマイコン３２によりスイッチ回路２３をオン状態に保持するので、一旦リモコン受光ユニット３１からの電気信号によりオン状態となった後にリモコン受光ユニット３１が光信号を受信しなくなっても、スイッチ回路２３のオン状態を保つことができる。

【００５０】上記第１実施形態のリモコン用受信装置を用いた家電機器について説明したが、家電機器に限らず他の待機状態となる全ての電子機器にこの発明のリモコン用受信装置を適用していもよい。

【００５１】(第２実施形態) 図３はこの発明の第２実施形態の光通信装置の概略構成図である。この光通信装置は、図３に示すように、光信号の送受信素子として、共通のＬＥＤを使用している。つまり、ＬＥＤを発光素子と受光素子の両方の用途として使用している。

【００５２】以下、上記光通信装置が待機状態から動作を再開するときの動作について説明する。

【００５３】上記光通信装置５０のＬＥＤ６０から送信された光信号Ｌr1は、光通信装置８０と同じ機能を有する別の光通信装置７０で受光されると共に、逆に光通信装置７０から送信された光信号Ｌr2は、光通信装置５０のＬＥＤ６０で受信される。そうすることによって、光通信装置５０と光通信装置７０との間で光信号による双方向通信を行う。

【００５４】上記光通信装置５０のＬＥＤ６０は、光信号送信時に駆動回路５９からの電気信号を光信号に変換(発光)し、光信号受信時に光通信装置７０からの光信号Ｌr2を電気信号に変換する。このとき、ＣＰＵ５３から出力される制御信号のハイレベルまたはローレベルによりＴx／Ｒx切替スイッチ６３を動作させて、ＬＥＤ６０を発光モードと受光モードに切り替えている。つまり、ＬＥＤ６０は、光信号を送信する場合はＬＥＤ６０を発

光モードとし、光信号を受信する場合はＬＥＤ６０を受光モードとして、送受信を同時には行わない。これにより１つのＬＥＤ６０(より広い指向角を得たい場合や、より強い光強度を得たいときなど、場合によっては、複数個のＬＥＤを一組として使うこともある)で半二重の双方向通信を行っている。

【００５５】データを送信する場合は、ＲＯＭ５５のプログラムに基づくＣＰＵ５３の制御により、ＲＡＭ５６に格納されているデータがＵＡＲＴ５７に転送され、ＵＡＲＴ５７でパラレルデータからシリアルデータに変換された後、変調機５８に転送される。そして、変調機５８で変調された信号は、駆動回路５９を通ってＬＥＤ６０から光信号Ｌr1として送出される。このときＬＥＤ６０は、ＣＰＵ５３からの制御信号により制御されたＴｘ／Ｒｘ切替スイッチ６３によって発光モードとなっている。

【００５６】一方、データを受信する場合は、例えば光通信装置７０から送信された光信号Ｌr2を光通信装置８０のＬＥＤ６０で受けて電気信号に変換する。そして、電気信号に変換された信号は増幅器６１で増幅された後、復調機６２に転送され、復調機６２でシリアルデータに復調した後、さらにＵＡＲＴ５７に転送される。その後、データは、ＵＡＲＴ５７でパラレルデータに変換された後、ＲＯＭ５５のプログラムに基づくＣＰＵ５３の制御によりＲＡＭ５６にデータを格納する。このときＬＥＤ６０は、ＣＰＵ５３からの制御信号により制御されたＴｘ／Ｒｘ切替スイッチ６３によって受信モードとなっている。

【００５７】上記ＣＰＵ５３，ＲＯＭ５５，ＲＡＭ５６，ＵＡＲＴ５７，変調機５８および復調機６２の機能ブロックを１チップの被電力供給回路としてのＬＳＩ７１で構成している。また、上記駆動回路５９，ＬＥＤ６０および増幅器６１で被電力供給回路を兼ねた光送受信ユニット７２を構成している。

【００５８】上記光通信装置５０と光通信装置７０との間で、ある一定時間通信が途切れると、光通信装置５０と光通信装置７０は、ＣＰＵ５３の制御により待機状態に入る。このとき、ＣＰＵ５３がその動作を終了すると、同時にスイッチ回路５２に対する制御信号が途絶えてスイッチ回路５２がオフとなる。その結果、光通信装置５０のバッテリー５１は各回路から分離され、バッテリーの消耗が限りなくゼロに近くなる。

【００５９】そして、待機状態にある光通信装置５０が別の光通信装置７０からの呼びかけによって電源を再立ち上げする場合、無バイアス状態にあるＬＥＤ６０が光通信装置７０からの光信号を受光し、これを電気信号に変換し、変換された電気信号がスイッチ回路５２をオンする制御信号としてスイッチ回路５２に送られる。そして、スイッチ回路５２がＬＥＤ６０からの制御信号を受け取ると、スイッチ回路５２はオン状態となり、各回路にバッテリー５１から電力が供給される。これにより、保持手段としてのＣＰＵ５３が動作を再開し、最初の動作としてスイッチ回路５２のオン状態を継続するようにスイッチ回路５２に対して制御信号を出力する。

【００６０】このように、上記スイッチ回路５２でバッテリー５１と各回路との間を遮断するので、待機時の消費電力を限りなくゼロにすることができる。また、送信側からの光信号を受信する通信用受光素子であるＬＥＤ６０をスイッチ回路５２の駆動用に用いるので、回路構成を簡略化でき、コストを低減することができる。また、待機時のバッテリー消耗を大幅に改善することができる。

【００６１】また、上記保持手段としてのＣＰＵ５３によりスイッチ回路５２をオン状態に保持するので、一旦ＬＥＤ６０からの電気信号によりオン状態となった後にＬＥＤ６０が光信号を受信しなくなっても、スイッチ回路５２のオン状態を保つことができる。

【００６２】（第３実施形態）図４はこの発明の第３実施形態の光通信装置の概略構成図である。この光通信装置は、図４に示すように、待機状態にある光通信装置の電源立ち上げのためだけに受光用ＬＥＤ４０を搭載したもので、受光用ＬＥＤ４０を除き第２実施形態の光通信装置と同一の構成をしており、同一構成部は同一参照番号を付して説明を省略する。なお、上記ＣＰＵ５３，ＲＯＭ５５，ＲＡＭ５６，ＵＡＲＴ５７，変調機５８および復調機６２の機能ブロックを１チップの被電力供給回路としてのＬＳＩ７１で構成すると共に、駆動回路５９，ＬＥＤ８１および増幅器６１で光送受信ユニット８２を構成している。

【００６３】図４に示す光通信装置８０において、待機状態にある光通信装置がリモコン操作によって電源を再立ち上げする場合、無バイアス状態にあるＬＥＤ４０が送信側の光通信装置７０からの光信号を受光し、これを電気信号に変換し、変換された電気信号がスイッチ回路５２をオンする制御信号としてスイッチ回路５２に送られる。そして、スイッチ回路５２がＬＥＤ４０からの制御信号を受け取ると、スイッチ回路５２はオン状態となり、各回路にバッテリー５１から電力が供給される。これにより、保持手段としてのＣＰＵ５３が動作を再開し、ＣＰＵ５３の最初の動作としてスイッチ回路５２のオン状態を継続するようにスイッチ回路５２に対して制御信号を出力する。

【００６４】このように、上記スイッチ回路５２でバッテリー５１と各回路との間を遮断するので、待機時の消費電力を限りなくゼロにすることができる。また、ＬＥＤ４０とスイッチ回路５２で電源制御装置を構成するので、回路構成を簡略化でき、コストを低減することができる。また、待機時のバッテリー消耗を大幅に改善することができる。

【００６５】また、上記保持手段としてのＣＰＵ５３に

よりスイッチ回路５２をオン状態に保持するので、一旦ＬＥＤ４０からの電気信号によりオン状態となった後にＬＥＤ４０が光信号を受信しなくなっても、スイッチ回路５２のオン状態を保つことができる。

【００６６】この発明の電源制御装置では、リモコン用受信装置や光通信装置に限らず、他の全ての電子機器に適用してもよいのは勿論である。

【００６７】上記第２，第３実施形態では、双方向の光通信を行う光通信装置について説明したが、一方向の光通信を行う光通信装置の受信側にこの発明を適用してもよい。

【００６８】また、上記第１～第３実施形態では、保持手段としてマイコン３２，ＣＰＵ５３を用いたが、保持手段はこれに限らず、スイッチ回路をオン状態に保持できる他の回路で構成してもよい。

【００６９】

【発明の効果】以上より明らかなように、この発明の電源制御装置およびモコン用受信装置および光通信装置によれば、被電力供給回路と電源との間の電源供給ラインの大元にスイッチ回路を設け、待機中はそのスイッチ回路をオフ状態とすることで電源から各回路への電力供給を遮断し、待機時の消費電力を限りなくゼロに近づけることが可能となる。これにより、携帯機器の場合は、待機時におけるバッテリーの寿命を伸ばすことが可能となる。また、上記スイッチ回路としては、トランジスタによる簡単な構成で実現できると共に、スイッチ回路の起動には、リモコン受光用または光通信用のＬＥＤの起電力を利用するので、大きな回路変更を行う必要がない。さらに、上記ＬＥＤは安価で手に入ることから、上記スイッチ回路の起動用に新たにＬＥＤ搭載してもさほどコストに影響を及ぼさず、より簡単にこの電源制御装置およびモコン用受信装置および光通信装置を構成することができる。

【図面の簡単な説明】

【図１】　図１はこの発明の第１実施形態のリモコン用受信装置を用いた家電機器の要部の概略構成図である。

【図２】　図２は上記リモコン用受信装置のリモコン受光ユニットの内部ブロック図である。

【図３】　図３はこの発明の第２実施形態の光通信装置のブロック図である。

【図４】　図４はこの発明の第３実施形態の光通信装置のブロック図である。

【図５】　図５はこの発明の電源制御装置の回路図である。

【図６】　図６は従来のリモコン用受信装置を用いた家電機器の要部の概略構成図である。

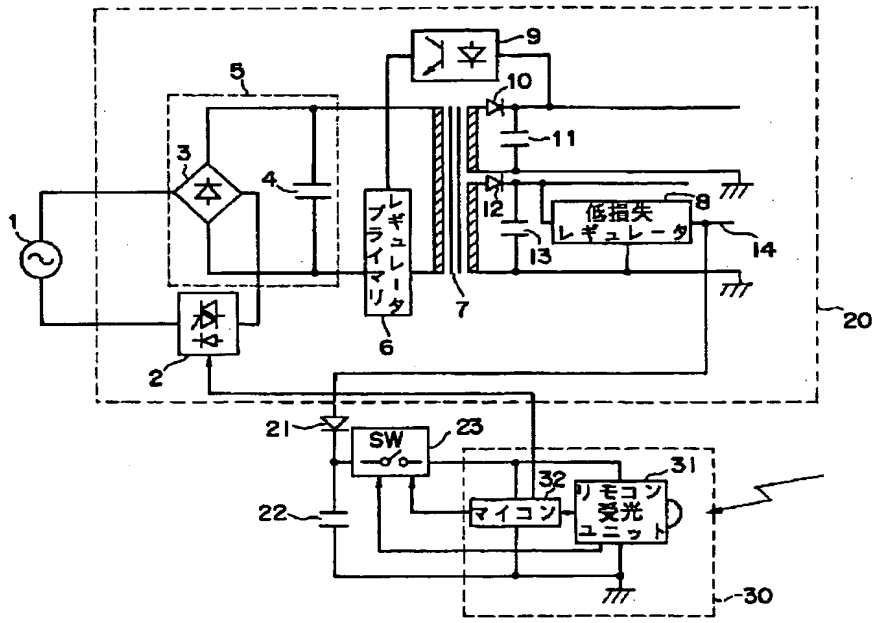
【図７】　図７は従来の他のリモコン用受信装置を用いた家電機器の要部の概略構成図である。

【図８】　図８は従来の光通信装置のブロック図である。

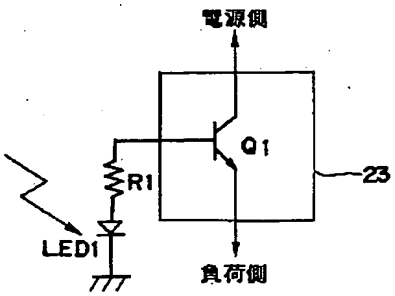
【符号の説明】

１…商用電源、
２…ソリッドステートリレー、
３…整流回路、
４，１１，１３…平滑用コンデンサ、
５…整流平滑回路、
６…プライマリレギュレータ、
７…電源トランス、
８…低損失レギュレータ、
９…フォトカプラ、
１０，１２，２１…ダイオード、
１４…ＤＣ電源ライン、
２０…電源回路、
２２…大容量コンデンサ、
２３…スイッチ回路、
３０…リモコン受光回路、
３１…リモコン受光ユニット、
３２…マイコン、
４１…ＬＥＤ、
４２…増幅器、
４３…バンドパスフィルタ、
４４…復調機、
４５…波形成形部、
５０，７０，８０…光通信装置、
５１…バッテリー、
５２…スイッチ回路、
５３…ＣＰＵ、
５４…信号バス、
５５…ＲＯＭ、
５６…ＲＡＭ、
５７…ＵＡＲＴ、
５８…変調機、
５９…駆動回路、
４０，６０，８１…ＬＥＤ、
６１…増幅器、
６２…復調機、
６３…Ｔｘ／Ｒｘ切替スイッチ、
７１…ＬＳＩ、
７２，８２…光送受信ユニット。

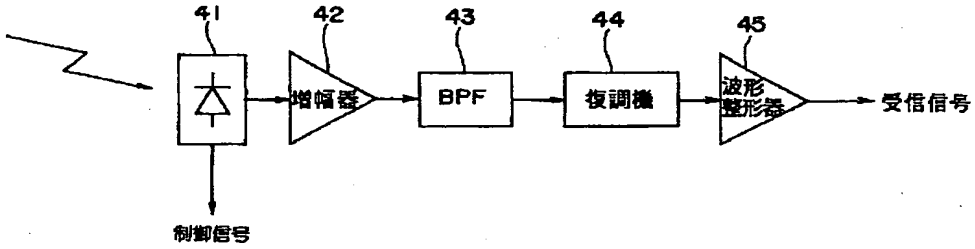
【図１】


1
2
3
4
5
6
7
8
9
10
11
12
13
14
20
21
22
23
30
31
32
レギュレータ
プライマリ
低損失
レギュレータ
SW
マイコン
リモコン
受光
ユニット

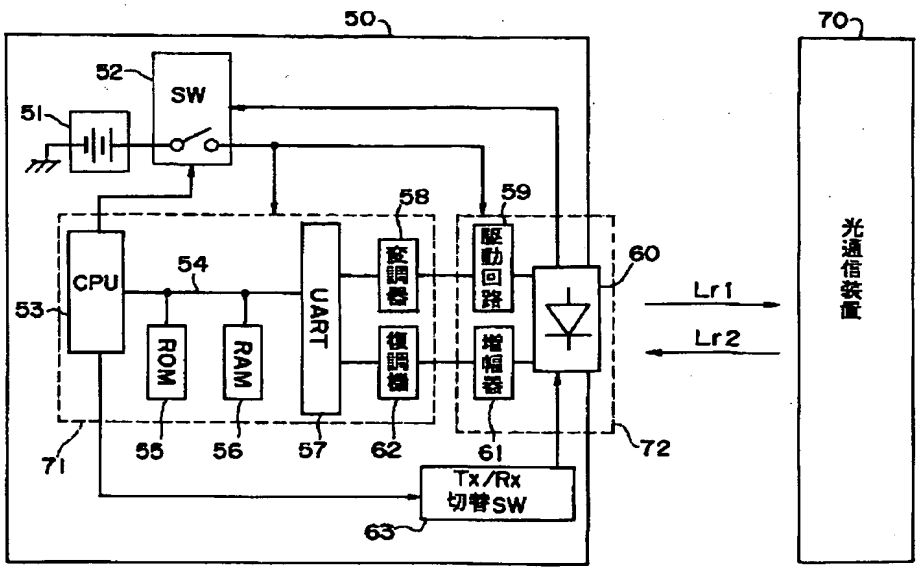
【図５】


電源側
Q1
R1
LED1
23
負荷側

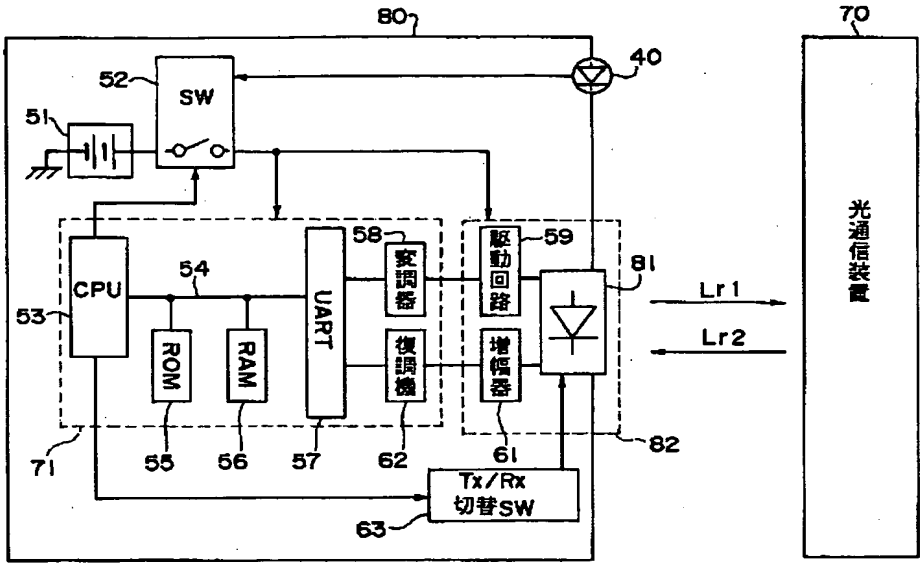
【図２】


41
42
43
44
45
増幅器
BPF
復調機
波形
整形器
受信信号
制御信号

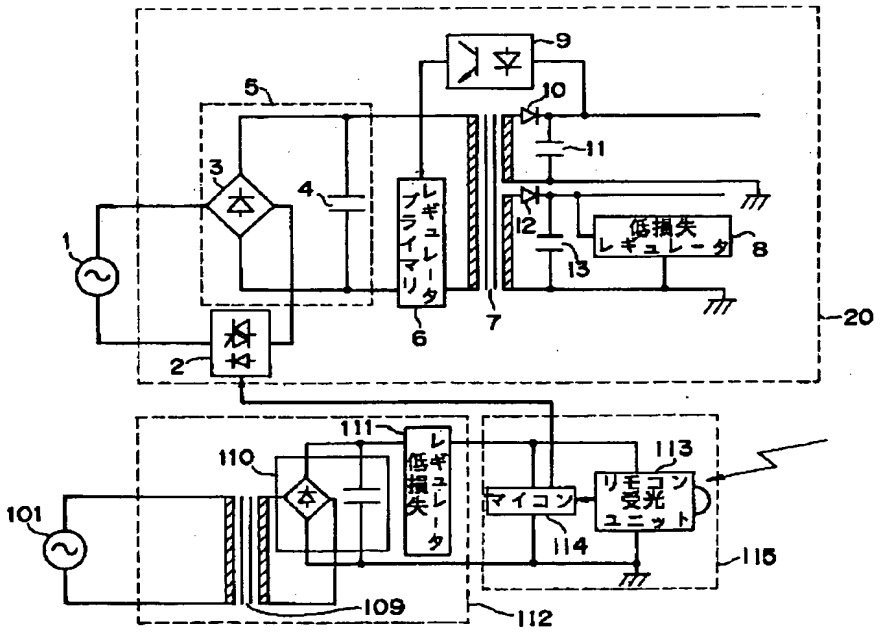
【図３】


50
52
SW
51
CPU
53
54
ROM
RAM
UART
58
変調器
復調機
59
駆動回路
増幅器
60
61
62
57
56
55
71
72
Tx/Rx
切替SW
63
Lr1
Lr2
70
光通信装置

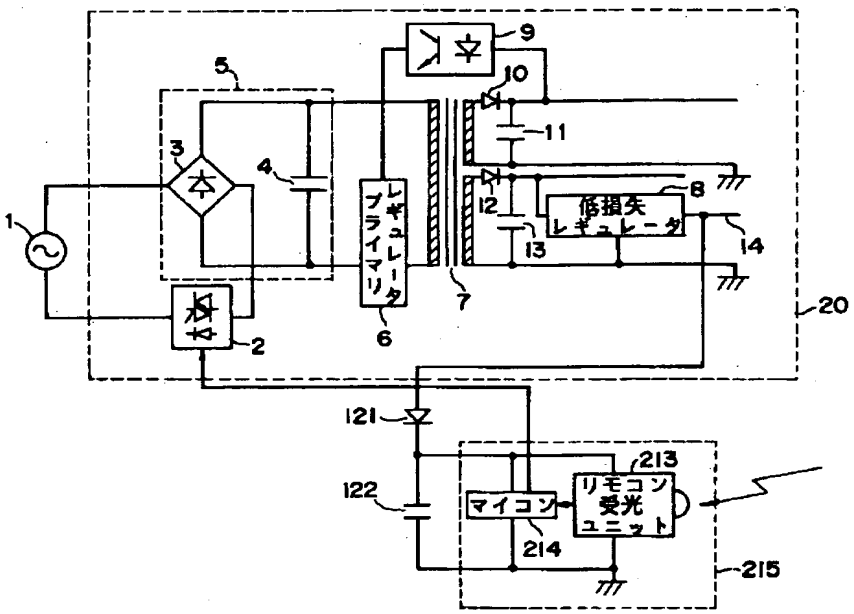
【図４】


80
70
40
52
SW
51
CPU
53
54
ROM
RAM
UART
58
変調器
復調機
59
駆動回路
増幅器
81
Lr1
Lr2
光通信装置
82
71
55
56
57
62
61
Tx/Rx
切替SW
63

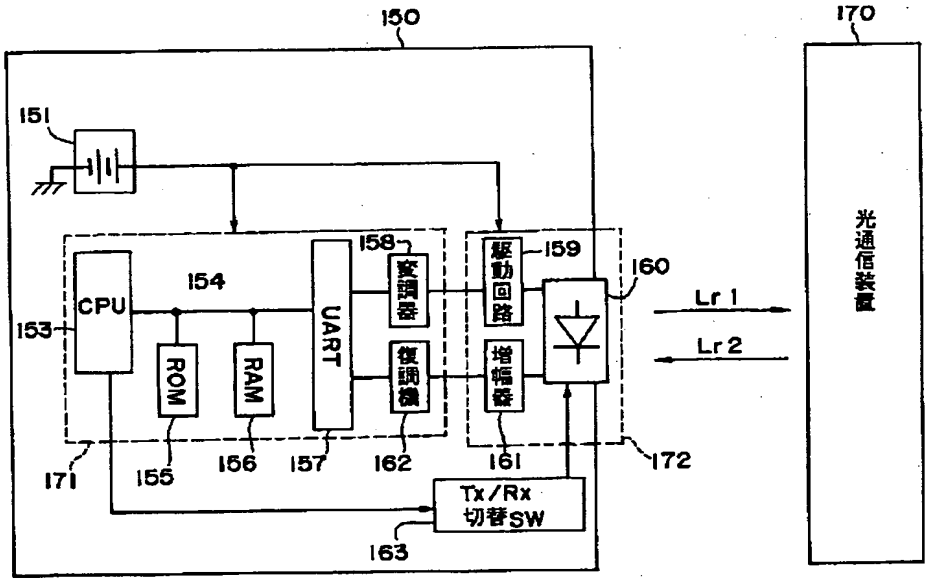
【図６】


9
10
11
5
3
4
1
レギュレータ
プライマリ
12
13
低損失
レギュレータ
8
6
7
20
2
111
110
レギュレータ
低損失
113
マイコン
リモコン
受光
ユニット
114
101
115
109
112

【図７】



【図８】



【手続補正書】
【提出日】平成１２年８月１０日（２０００．８．１０）
【手続補正１】
【補正対象書類名】明細書
【補正対象項目名】００５３
【補正方法】変更
【補正内容】
【００５３】上記光通信装置５０のＬＥＤ６０から送信された光信号Ｌr1は、光通信装置５０と同じ機能を有する別の光通信装置７０で受光されると共に、逆に光通信装置７０から送信された光信号Ｌr2は、光通信装置５０のＬＥＤ６０で受信される。そうすることによって、光通信装置５０と光通信装置７０との間で光信号による双方向通信を行う。

【手続補正２】
【補正対象書類名】明細書
【補正対象項目名】００５６
【補正方法】変更
【補正内容】
【００５６】一方、データを受信する場合は、例えば光通信装置７０から送信された光信号Ｌr2を光通信装置５０のＬＥＤ６０で受けて電気信号に変換する。そして、電気信号に変換された信号は増幅器６１で増幅された後、復調機６２に転送され、復調機６２でシリアルデータに復調した後、さらにＵＡＲＴ５７に転送される。その後、データは、ＵＡＲＴ５７でパラレルデータに変換された後、ＲＯＭ５５のプログラムに基づくＣＰＵ５３の制御によりＲＡＭ５６にデータを格納する。このときＬＥＤ６０は、ＣＰＵ５３からの制御信号により制御されたＴx／Ｒx切替スイッチ６３によって受信モードとなっている。

フロントページの続き

Ｆターム(参考) 5G065 AA01 DA04 KA02 KA05 KA08
5K002 AA03 BA14 EA04 FA03 GA04
GA07
5K048 AA16 BA01 DB04 DC01 EB02
HA04 HA06 HA11 HA24 HA33
HA37 HA38